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ABSTRACT

The works reported in this book represent a second phase to a 2-day summer conference that focused on assessment in mathematics and science classrooms. This book presents research and findings of a subset of the conference participants who investigated a self-selected aspect of assessment in their educational environments. Action research was the tool for the investigations and assessment was the focus. Reports include: (1) "Communicating Math Progress to Parents Using Rubrics" (Bev Grueber and Joan Anthony); (2) "Improving Parent Communication through Alternative Assessments" (Candy Connery); (3) "Using Student Portfolios to Communicate Progress to Parents" (Trish Guinan); (4) "Will Students Benefit from Different Forms of Student Evaluation" (Russ Wissing); (5) "Self-Assessment and Self-Esteem with Portfolios" (Arlene Gnirk); (6) "Student-Teacher Created Visual Rubrics: Models To Guide and Assess Research Projects' (Suzanne Ratzlaff and Rod Diercks); (7) "Grand Slam/Base Hit/Strike Out" (Julia C. Polak); (8) "Creating Effective Student-Centered Rubrics" (Karen Barry); (9) "Using Rubrics to Assess Students' Writing in Mathematics" (Kim Potter); (10) "Using Multi-Modal Assessment for Hands-On Science Activities" (Shane Gallagher); (11) "Student Self-Motivation from Student-Teacher Assessment of a Sixth Grade Math Skills Checklist" (Guy R. Roggenkamp); (12) "Self-Assessment Activities to Improve Student Performance" (Brenda Charles); (13) "Self-Assessment in the 9th Grade Science Room: A Usable Document and Relationship to Learning" (Linda S. Graham); (14) "Using Checklists to Improve Student Self-Assessment" (Stephen Hamersky); (15) "In a State of Change" (Dot Snesrud); (16) "Connections between Perceived Competence and Understanding Assessment" (Caroline Winchester and Dianne Vorderstrasse); (17) "Alternative Assessment for a Geometry Benchmark" (Jackie Thomas and Donna Trout); (18) "Traditional vs Alternative Test Results" (Mary E. Stiverson); (19) "Testing for Algebra Readiness" (Vincent Moragues); (20) "Necessary Components of a Rubric" (Audrey Bacon); (21) "Do They Really Understand Fractions" (John Moon); (22) "The School Improvement Process" (Gail Sears); and (23) "The Marigold Project: A Reflective Conversation" (Kathryn A. Ahren and Suzanne Oldham). Appendices include Action Research Rubrics and a list of participants. (JRH)

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ASSESSMENT IN ACTION:

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Focused on Mathematics and Science Assessments

Reports of Twenty-Three Teacher-Research Projects
edited by
De Tonack, Ceri Dean, and Sally Robison

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— INTRODUCTION —

by
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Nebraska Mathematics and Science Initiative
Collaborative Action Research Facilitator

Overview of the Project

There are many descriptors for what education is being asked to do: reform, restructure, renovate, renew. Whatever the terms, the challenge appears to be the reshaping of education into a more effective vehicle that is attuned to societal and student needs. During the last decade, educational journals and lecturers have continuously raised the banner of change by delivering philosophies and rationales for restructuring American education. What may be needed more than words goading people into action are examples of that action.

Conferences and workshops are common vehicles for conveying and stimulating change and action. Many conferences, however, conclude with participants going home, some to put a few things into practice and some to put the materials and ideas on their dusty office shelves, along with other forgotten conference artifacts. To keep the momentum for change and action generated by a conference, perhaps a conference should be regarded as the first step in a two-step process. That was the view adopted by organizers of this project. The works reported in this book represent a second phase—a "morning after"—to a two-day summer conference that focused on assessment in mathematics and science classrooms. A subset of the conference participants extended their commitment to assessment by taking action during the following school year. Individuals and teams of individuals investigated a self-selected aspect of assessment in their educational environments. This book presents their research and their findings.

The collaboration and research, led by De Tonack, Nebraska Mathematics and Science Initiative, were facilitated by three all-day seminars involving the teacher-researchers. Communication between seminars was conducted via electronic mail, postal mail, and phone calls. The project concluded with a mini-conference in which the researchers presented their findings to each other and to invited guests. Some teacher-researchers received college credit for their work. Credit required a structured portfolio of each individual's work. The portfolios included the following items: table of contents, rationale for selection of items in the portfolio, evidence of investigation focused on assessment, evidence to support conclusion(s), evidence of reflection, evidence of collaboration, evidence of review of outside resources, plan of action after the investigation was completed, and a self-designed self assessment of the portfolio. Exhibits in this book include some of the items from the portfolios. Appendix A exhibits the rubric and requirements for those participants receiving college credit. Appendix B lists the participants and their addresses.

Action Research

Action research was the tool for the investigations and assessment was the focus. Richard Sagor's work, *How to Conduct Collaborative Action Research* (1992), was the guide book for the research process. Sagor defined research as any effort toward disciplined inquiry, involving a wide array of methods from both the quantitative and qualitative domains. Like any research, action research is a systematic process to acquire valid and reliable data concerning some phenomenon. Action research involves formulating the problem, collecting data, analyzing data, reporting results, and planning the next steps to put into action. Action researchers most often look at what they themselves are or should be doing. In education, action researchers often focus on initiating action, monitoring and adjusting action, or evaluating some action. Generalizability—the applicability of the research findings to other sites and situations—is usually restricted to the immediate context of the researcher. Although the results of the research can provide insight for other individuals and describe procedures that they wish to enact and investigate, the goal of the investigations is to understand what is happening in the researcher's environment and what might improve that environment.

Collaboration is perhaps the most important component of the action research process. The power of collaboration and networking was evident in each of the project seminars and is evident in the reports in this book. Educators turned to their colleagues, their students, the parents, and a review of assessment literature to test and discover what worked in the context of their classrooms, districts, or the state. In his cited work, Richard Sagor commented, "By turning to collaborative action research, we can renew our commitment to thoughtful teaching and also begin developing an active community of professionals" (pg. 10). Emily Calhoun, author of *How to Use Action Research in the Self-Renewing School* (1994), summarized this process as "learning to inquire together, to generate knowledge and action simultaneously" (cover).

Assessment

Measuring What Counts (1993), a policy brief by the Mathematical Sciences Education Board of the National Research Council, gave the organization and focus to the summer assessment conference. Consequently, the brief also became a springboard for our project's focus on assessment. Although the brief speaks specifically to mathematics education, it communicates to all educators who are investing time in changing assessment. It presents a conceptual framework for assessment and suggests three fundamental principles as the foundation of all assessment:

- **The Content Principle**: Assessment should reflect the mathematics that is most important for students to learn.
- **The Learning Principle**: Assessment should enhance mathematics learning and support good instructional practice.
- **The Equity Principle**: Assessment should support every student's opportunity to learn important mathematics.

Measuring What Counts also presents a challenge to educators: "Assessment in support of standards must not only measure results, but must also contribute to the educational process as well" (pg. vii). The investigations undertaken for this project provided a means for the teacher-researchers to begin to meet that challenge.

The Course and the Teacher-Researcher Participants

Twenty-one of the twenty-eight teacher-researchers completed a three hour, tuition-free graduate course in the Curriculum and Instruction Department of the University of Nebraska at Lincoln. The others were involved for a variety of reported reasons including professional growth or advancement within their school districts, an incentive to try alternative assessments, or to give or get a support group for taking risks in making change. Several of the participants were members of the State Frameworks team of educators that was creating assessment guidelines and models for classroom use. No stipends or mileage reimbursements were given to the participants. Free tuition and free lunch were the only financial remunerations. Initially, forty-eight individuals indicated they were interested in pursuing action research projects and attended the first meeting for the project. For some, time commitments soon overwhelmed their intentions, and they withdrew from formal participation in the project. Several continued to communicate with other participants and/or the project leader, however. Teacher-researcher roles can produce conflicts. Most project participants, at some point in their investigations, expressed frustrations and comments similar to, "How do I do both? What did I get myself into? I've never done research before!" Those same individuals expressed affirmations of the process upon completion of their projects: "It has been one of the most exciting, confidence-building, enriching experiences of our careers."

The first all-day seminar was held in August, 1994, at a hotel conference room in Lincoln, Nebraska. A smorgasbord of assessment articles provided by the facilitator greeted the participants as they signed in for the seminar. They introduced themselves to each other with name, school, and why they were there. Most implied they needed encouragement and support to do what they knew they should be doing (changing assessment practices). Next, participants viewed an excerpt from a National Education Association Learning Center video showing the use of action research. Participants divided into groups to talk about their definitions and perceived reasons for doing action research. They had received Richard Sagor's book *How to Conduct Collaborative Action Research* prior to the seminar, and it was the resource for the discussions. Facilitator De Tonack then addressed and interacted with the group about the action research process. Next, the focus switched to assessment. In large and small groups, the educators discussed types and definitions of assessment, rubrics, portfolios, self-assessments, and any other topics they related to assessment. Before lunch, self-paired groups used Sagor's process called "reflective interviews" to begin the discussions of problems and issues individuals were considering for their investigations. In a reflective interview, one partner interviews the other for twenty to thirty minutes. When the leader calls time, the roles reverse. The process is an interview, not a discussion. The interviewer asks clarifying questions and gives appropriate probes to help the interviewee explore his feelings and ideas. Five university instructors and two staff members of the Eisenhower High Plains Consortium assisted Dr. Tonack in facilitating the interactions. The small groups presented their assessment issues to the whole group. From this reporting, nine initial categories surfaced: rubrics, self-assessment, communication to parents, portfolios, writing, performance tasks, group and project work, teacher or student change, and test score correlations.

After lunch, participants met in groups representing the nine categories defined before lunch. The groups, assisted by the facilitators, used a process called "analytic discourse," as described in Sagor's work. This form of discourse assumes an interview format. The interviewers can only ask questions, can make no critical comments, and can offer no solutions. The purpose is to help the interviewee come to a full understanding of his/her knowledge about the issue in question. The afternoon presentation included a description of data-gathering methods. The small groups, after some reshuffling, continued

with a discussion of their possible research questions and data-gathering techniques. Participants left the meeting with forms for reporting problem statements, research questions, proposed data collection methods, collaborators, and critical friends. Many also left with a combination of excitement and anxiety. The forms were returned within a few weeks. Names, addresses, phone numbers, and areas of investigation were mailed to all participants in September, 1994.

The second seminar was held in November in Grand Island, Nebraska. Again, participants were greeted with an assortment of articles focusing on assessment practices. The meeting was opened with excerpts from an assessment video prepared and distributed by the Association for Supervision and Curriculum Development. Since many researchers were investigating rubrics, a role play situation was used to stimulate a discussion on the issue. Groups were given the length of the radius bone of a fictitious crime victim from which they were to determine other features of the victim. One member of each group was given a prepared rubric to evaluate the other members of the group. Unknown to other participants, one group was purposefully asked to misconstrue the instructions and the mathematics involved while meeting all points on the rubric. An evaluator in another group was asked to give low scores, even though the group performed well. When these scenarios were enacted during the reporting of the groups, the difficulties in making useful rubrics and assigning point values for analytic scoring were highlighted and discussed. Dr. Tonack had prepared a draft of a rubric for those receiving college credit as shown in Appendix A. The participants discussed and made suggestions to refine the rubric. The remainder of the day was spent with large and small groups talking about their research questions, their data gathering, and their progress and frustrations. The discussions were interspersed with suggestions from Dr. Tonack for analyzing data and activities addressing equity in assessment led by Dr. Teresita Aguilar.

The third seminar was conducted in February, 1995, in Lincoln. The session opened with collaborators talking and interacting. There was no need to prompt their discussions. They were captivated by assessment, action research, and networking. Several had visited each other's classrooms before this seminar. Others were talking about linking their classrooms via Internet. They then turned their attention to sharing their review of literature on assessment. The rest of the day was spent with individuals and teams giving glimpses of their research to all the participants. This time, they left the seminar exhilarated. They had done research; their results were useful and practical; they were becoming the experts in their educational environments.

The fourth seminar was the mini-conference held in March at the University of Lincoln campus. In addition to the presenters, approximately sixty invited guests came to hear the four rounds of presentations, each with five presentations. This provided closure to the project, an opportunity to share findings, and summary to the research.

What Did We Learn? What Did We Collectively Say?

The statements that follow reflect new understandings about assessment, teaching, learning, and collaboration that the teacher-researchers developed through their participation in the project.

> *My name isn't Dorothy, it's Audrey. This isn't Kansas, it's Nebraska. But the June 13-14, 1994, Assessment Conference was a "storm cell" that evolved into a "tornado" in my life! Follow my "Yellow Rubric Road" to see what happened since then!*

Parents said talking through the rubrics showed much more about real understanding than a number grade on a report card. It takes some time, however, to understand and become accustomed to rubrics. Student and parents talking about the student portfolio creates an effective parent conference and stimulates communication.

Collaboration is best when based on mutual benefit and trust. Each individual has something to give that benefits the other. Reflective conversations surface the rationale for and definitions of alternative assessments. Collaboration is time consuming and moves in uneven energetic bursts. Collaboration and networking are the power within action research.

When we changed our assessment, we changed our instruction.

Rubrics used for assessment of student performance tasks should be shared with the students and the students should understand what is expected. For students to reach the highest success levels on the performance tasks, they need to have ownership of the assessment instrument. This is best achieved by allowing the students to write their own rubric or to rewrite a teacher-created one. Students will need guidance and helpful suggestions at the outset of the attempt to write rubrics, but the more they are allowed to do, the easier the process becomes for both student and teacher. When students own the rubrics to measure their performance, their performance improves.

Visuals help rubrics come to life and have more meaning for students.

Rubrics, pretests, and checklists can be used to set goals as well as to evaluate learning.

If students can see their work in portfolios, they can see their progress and gain deserved self-esteem.

It is difficult to hand over some of the control and decision making to the students; it is hard to "step back and let go."

Evaluating alternative assessments takes more time than evaluating traditional assessments. Grading can be a reality barrier to innovative alternative assessments.

Students believe alternative assessments can more accurately reveal what the student knows, but some students, in open honesty, remark that they do not like alternative assessments because they cannot guess the answers.

Action research never ends.

Research Projects and Reports

The degree of research collaboration varied. Twelve of the teacher-researchers conducted research projects without a colleague doing the same research, although they had critical friends within their own districts or towns to support and critique their work, and they had support within the total group that met at the seminars. Three individuals focused on the same topic and presented together but conducted their own research. Several groups were from the same school district and, although they were answering different questions, did parallel studies. One researcher studied the students in another researcher's class. One studied another teacher's actions and assisted her while the teacher enacted different procedures and assessments for students who were doing research themselves. Two math teachers from the same high school worked at developing a benchmark assessment for their district. Two teachers, actively involved in team teaching, used their combined efforts and classrooms to create visual rubrics. Several researchers were from different school districts but had similar questions. They joined efforts and feedback to create one presentation of their research.

Each report in this book begins with an abstract briefly describing the research and conclusions. Following each abstract are exhibits reflective of key elements of the work. The exhibits may include surveys, survey results, student work, rubrics, or reflections from the researcher, student, or parent.

We have included names, home addresses and schools of the teacher-researchers in Appendix B.

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— REPORT 1 —
COMMUNICATING MATH PROGRESS TO PARENTS USING RUBRICS

Bev Grueber and Joan Anthony

ABSTRACT

Parents at Elkhorn Hillrise Elementary and North Bend Elementary have expressed concern about their children's progress in mathematics. We believe this is due to the lack of documented evidence collected and shared with the parents by the teacher. We want parents to have solid evidence about their children's progress in math. We wondered if rubrics could provide such evidence; therefore, we asked and tested the question, "Can rubrics be used for improving communication about math progress to elementary parents?" After using rubrics at the conclusion of four math units, we found parent and student comments became more favorable. Parents understood what a rubric was and appreciated the usefulness of rubrics for communicating information about their child's progress in mathematics.

Students are typically given computational or fill-in-the-blank tests to assess progress at the end of a unit in math. In our research, different methods of assessment were used for children in the third and fourth grades. At the end of four different units, students were asked to solve a real-life problem and communicate their thinking. Children were asked to spend $100 for gifts, plan a picnic, plan a Nebraska birthday celebration, and decide whether to buy a zoo membership or pay each time. Children were free to solve the problem any way they chose. An important part of the assessment was the child's communication of how he or she chose to solve the problem. The content, strategic thinking, and communication of the project were scored using a rubric as shown in the exhibits. The scored project and rubric were sent home with the parent/learner assessment form. The form gave parents and children the opportunity to discuss the project. Parents reflected on their child's work, scored it accordingly, and, together with their child, commented on the learning.

Parents felt that the projects were meaningful and that the rubrics and the mean and median scores gave them the information they needed to understand the progress their child was making in our mathematics curriculum. Parents called about exciting progress and areas of concern more than ever before. They commented that it was the first time they had ever sat down with their child and really communicated about what they were doing and the processes their child was using. This reaction was true regardless of the child's score.

The response of parents is the catalyst for continuing the use of rubrics. Thus, our project with rubrics is not completed. Rather, it is just beginning. Extensions include student-written rubrics, parent/child-scored projects using rubrics, and incorporation of rubrics in other subject areas. To build an effective community of learners, teachers and students alike must be empowered to make changes and be accountable for their learning. Authentic assessment and the use of rubrics are channels for change.

EXHIBITS - Report 1

A. Parent/Guardian/Learner Assessment Form

Name: _____
Assignment title or description: _____
Date assignment completed: _____
Begin the assessment by showing them the work and explaining to your parent(s) or guardian(s):
( ) what the assignment was about
( ) what you think you learned
( ) what you think you did well
( ) what you think you could do a better job on
( ) what you had difficulty on and why
Parent/guardian reflection on student work:
Rank your satisfaction with your student's effort level. Use ten as the high and one as the low. _____
Give your student a score of one to ten on the appearance of their work. Ten is high and one is low. _____
Are you satisfied with the work your learner has accomplished? _____
If you are very satisfied, a ten is the score, etc., down to a one.
If dissatisfied, what would you like to see improved?
Comments.

B. Rubric for Student Project

	4 Commendable	3 Satisfactory	2 Some level of achievement	1 Learning in Progress
Content	applies content to other situations & curricular areas	demonstrates fundamental content knowledge	demonstrates partial mastery of content	demonstrates a lack of content knowledge
Strategic Thinking	able to visualize and solve problems in a variety of ways	able to visualize problems but is limited to one solution	attempts solutions but omits significant parts	shows no understanding of problems; fails to complete problems
Communication	communicates, reflects, and generalizes about processes and purposes	language used to reflect and generalize is at the literal level	works at solving problems but has difficulty explaining processes	unable to communicate processes and purposes of problem solving

EXHIBITS - Report 1

C. Parent Comments

- Now I understand exactly what concepts my son really understands.
- My son was totally confused about what subject he was even working on. He can multiply but doesn't have a clue about how to read and solve a problem. He said he likes problems with numbers written out.
- My daughter shared a lot with me. It's obvious, abstract things are tough for her.
- It was interesting to hear my son explain math to me. He sees it from a different view than I do, but found a solution he could understand and explain.
- After I understood what a rubric was, we are very satisfied to see her progress in this form. Doesn't it take a lot of extra time to do it this way?
- If our son does his daily work in a rush like when he explained the packet to us, we can see why he omits important parts. In our chat, we encouraged him to slow down and believe in himself.
- I think our child does very well, but she skips steps in explaining and we encouraged her to slow down. She enjoys the work she is doing and says this way she can be a math detective. We're pleased with reporting real progress this way.
- It would be unrealistic to give my child all 4's. She had some trouble explaining in detail how she solved the problem. Overall, I'm pleased with her performance. Interesting approach to sharing my child's progress.
- Our son gets really upset if he can't figure something out right away. But talking about this with him, we kept encouraging him not to give up.
- Why don't we use rubrics for sharing progress in all areas?

D. Student Comments

- Telling my mom really made me think. I'm glad I could understand and remember. Mom liked talking to me about math.
- Doing this was interesting. It was in between hard and interesting.
- It is hard to write down how I know things. It was easier to just tell them to my mom and you.
- This was difficult. I'm not good at telling about word problems. I like just numbers.
- I liked doing it better than explaining. I like to do challenging things.
- It was difficult but I liked it because I had to know how to do it to tell dad. He had some silly questions.
- I want math to be kind of easy and have numbers so it isn't hard to think.
- I like thinking math things. Never told anyone how I think before.

— REPORT 2 —
IMPROVING PARENT COMMUNICATION THROUGH ALTERNATIVE ASSESSMENTS

Candy Connery

ABSTRACT

This study examined alternative assessments that enhance parent communication: journals, portfolios and learning buckets. Although I have had students journaling for the past six years, this was the first year I shared a great deal with parents about how I use this tool to direct teaching and learning. Data were gathered from sixteen sets of kindergarten parents through journal surveys, feedback after using twelve learning buckets, and a portfolio conference.

Student journaling was done on a daily basis for the first thirty minutes of the school day. It consisted of student illustrations of daily events, including math and science activities, accompanied by dictation to the teacher. Dramatic progress was noted for all students' detail and accuracy of illustrations as well as ability to write and verbally communicate.

Learning buckets featured the child as the teacher to the parents in a variety of formats with science/math manipulatives. A bucket of math or science materials was sent home for one night with the intention that the child would teach his/her parents and siblings at home. Directions and suggestions for extensions were included with the materials. An optional survey accompanied each learning bucket. Parents were asked to comment on which process skills they observed their child using in the activity. These process skills were taken directly from the Nebraska Math and Science Frameworks.

Portfolios consisted of student work that represented growth in math, science, language and writing. A portfolio conference was scheduled with parents in March.

Research revealed that parental perception of student goals closely resembled those of the educator. Parents do understand that much learning takes place in a science/math hands-on activity, and sending materials home helps parents observe this important characteristic of an effective primary program. Evidence suggested that parents highly value journals and portfolios as assessment tools. Parents perceived multiple process skills in the math and science activities they shared with their children at home.

EXHIBITS - Report 2

A. Researcher Reflections

I see great value in all three of the alternative assessments I worked with during the school year. However, if I only had time for one I would choose journals. I see things in journals that I would not otherwise learn about my students. For example, Neil is an active child who, given a choice, will choose movement or nonsedentary activities every time. Never has he voluntarily chosen the library, art center or "office." His center choice has always been blocks (building), dramatic play or music and movement. He has a difficult time with counting, recognizing letters and discriminating letter sounds. However, over the past few months, Neil has developed into a skilled artist and shares this talent with us in his journal each morning. He began by replicating block structures he had built the day before and progressed to drawings of things like the San Francisco Bridge.

B. Parent Survey Concerning Student Journals

Dear Parents,
Do you remember your initial reaction to a kindergarten journal and if you do, would you please share it?
What is your reaction now that you've had a chance to see four or five journals?
I had previously listed these items as my reasons for using journals. Please rank 1-5 (1 being highest) in their order of importance to you:

_____ awareness of time (last night, yesterday, today)
_____ fantasy/reality
_____ evidence of learning (uses patterns, reports on something we did in class)
_____ presence of writing (letters, words, numbers, scribbling counts too!)
_____ social awareness (reports on others)
_____ progress of illustrations
_____ dictation (is it clear? does it make a sentence?)
_____ do sentences relate to each other? (is it fluent?)
_____ writing own words within dictation (this usually occurs after several months)
_____ invented spellings ("I wt skt" for "I went skating.")
_____ schema (recurring themes in drawings)

In the order of number of parents selecting the item as first choice, the following were rated most important: fantasy/reality, awareness of time, presence of writing, social awareness, progress of illustrations, and evidence of learning. Observations about their children included comments about the child as a learner (observant, creative, patient, fluent, intelligent, self-motivated) and about what the child had accomplished (interpreted data, observed differently "than I would," concentrated, learned terms, conceptualized better than expected, solved problems, mixed playing with learning).

EXHIBITS - Report 2

C. Learning Bucket Information and Parent Survey

Dear Parents,
You have not received a learning bucket in a while. We got very busy with seasonal activities. The experiment you are about to try is technically called chromatography, the process of drawing individual pigments or colors on a medium (in this case, a coffee filter) through a solvent (in this case, water). For the kindergartners, we call this "Color Changes." Materials are coffee filters, half gallon milk container or Tupperware tub, black pens, colored pens, straws, and tape.

Procedure:
1. Fill tub with about 1 to 2 inches of water.
2. Use a filter paper attached to a straw. Have your child draw a single line about 3/4 inch from the bottom of the filter paper.
3. Set the straw on top of the tub so the water barely hits the bottom of the filter paper but does not hit the ink line.
4. Results will be dramatic for most pens. Permanent pens are not water soluble. Ball points are not effective, either.
5. Repeat the process with other black pens. Have your child give you an explanation of this phenomenon. You will learn a lot about them through their explanation. Accept any explanation and don't expect Einstein.
6. Extensions: Try colored pens. Your child can predict what colors will come out of an orange marker, etc. Do all orange markers produce the same pattern and colors? Try blues, browns, and reds.

You may think of other extensions. We tried putting ice in the water to see if there was a change.
Please take a moment to fill out the evaluation form.

Your child has brought home a learning bucket he or she should be able to share with you. If there is time, please fill out the survey following the activity. This is a confidential and voluntary survey, so you do not need to sign your name. It will be used for research in alternative assessment and communication with parents.

1. What do you think your child learned from this activity?
2. What did you learn about your child?
3. Which process skills do you think are involved in this activity?

classifying	patterning	communicating	inferring
problem solving	predicting	interpreting data	questioning
measuring	reasoning	observing	

Most parents chose at least three process skills in each activity. Observing, classifying, and patterning were chosen most often.

— REPORT 3 —
USING STUDENT PORTFOLIOS TO COMMUNICATE PROGRESS TO PARENTS

Trish Guinan

ABSTRACT

This project involved students conferencing with their parents about the student's progress in math class. A trigonometry class composed of thirteen seniors was used in the experiment. Parents were requested to join their child for an evening conference to discuss the student's progress after seven weeks in the course. As with our school's "regular" parent-teacher conferences, there was no requirement that the family must attend.

The letter as shown in the exhibits was sent home to the parents to inform them of the special conferences. Due to a snowstorm the night before the conference, last minute conflicts prevented some students/parents from attending. Two students were on family vacation the night of the conference.

A preconference and postconference survey were distributed to the parents to evaluate the process. The rate of return for the postconference evaluation was a problem. The return rate might have been improved by having parents complete the survey the night of the conference.

The students had two portfolios to share with their parents. One was a notebook that they brought to class daily. It included a grade sheet with a computed, current course grade. It also contained class notes and some homework assignments. The other portfolio was an individual folder that remained in the classroom at all times. This portfolio contained some tests and quizzes, along with some graded and non-graded homework assignments.

The students assisted in developing an outline of topics that would be discussed with their parents at the conference. During the 15-20 minutes that the conferences took place, I was able to visit with each group. I found the parents had very few questions because the students had already answered them. The parents responded very positively to the portfolios. They enjoyed seeing physical evidence of their child's progress. Parents were invited to visit with me privately following the conference, but only a few felt a need to do so. I found the evening to be very pleasant and comfortable, despite my role as a facilitator of the conferences. The students seemed very comfortable, also. This may be due to the use of cooperative learning on a frequent basis in this class.

The survey results were very positive and indicated a need for this type of communication to continue.

EXHIBITS - Report 3

A. Parent Invitation to Conference

To: Parents/Guardians of 7th Period Trig Class Students

As you are aware, _____ is currently enrolled in my 7th period Trig class. You recently received a reminder about the High School Parent/Teacher Conferences coming up next week. This is an opportunity for you to find out how your child is doing in his/her classes during the second semester.

Some parents may find the current method of conferencing uncomfortable and impersonal. At peak times, there are often lines to wait in to see various teachers. Once you reach the front of the line, there may be others waiting right behind you, and they may overhear your conversation with the teacher. It's difficult to secure privacy.

For these reasons, I have decided to experiment with a new type of conferencing. I am currently taking an action research assessment class and I'm interested in helping students do more self-assessment. I have asked the students in 7th period Trig class to attend a special conference with their parents on Tuesday, March 7th, at 6:30 p.m. After a brief explanation, I will ask each student to conference with their own parents about how they are performing in Trig class. Since all of the students in this class are seniors, I feel this is an opportunity for them to communicate with their parents about their education—a step that may be important in the future as most of them plan to further their education next year.

I am asking that one or both parents (or guardian) please join your child for this special conference on Tuesday, March 7th, in room B134 at the High School. After a short introduction, the students will conference with their parents for approximately 15 minutes. We will have three classrooms available to conference in and I will be circulating to all groups (there are 13 students in this class) to answer any questions/concerns. You will have a chance to see samples of the work your child has done in class, including tests and homework assignments. The student may leave at the end of the conference, and you are then welcome to speak with me in private if you so desire.

Please RSVP through your child. I will be asking for a final confirmation during class on Monday, March 6th. If you are able to attend this special conference, there is no need to stop by my desk at the regular Parent/Teacher Conferences on Monday evening. If you are unable to attend, please feel free to visit with me on Monday evening or call me at any other time.

EXHIBITS - Report 3

B. Outline for Student-Parent Conference

I. Welcome and introductions
II. Students share progress with parents
  A. Notebooks
    1. Explain the purpose of the notebook.
    2. Is my notebook organized?
  B. Grade sheet explanation
    1. Do I keep track of my grades?
    2. How often do I inform my parents of my progress?
  C. Homework
    1. Is my homework done on time?
    2. How accurate is my homework?
    3. When and where do I work on my homework?
    4. Describe how homework has helped me on the tests.
  D. Tests/quizzes
    1. How do I prepare for exams?
    2. Do I come in for help when needed?
  E. Behavior
    1. How do I actively participate in class?
    2. Has my attendance been a factor in my grade?
    3. In class, how do I focus on Trig and think mathematically?
  F. Other
    1. How have I improved in math this year?
    2. What part of Trig am I doing well on? Why?
    3. What part of Trig do I need to improve on? Why?
    4. If appropriate, during the last 10 weeks what might I do differently?
III. Closure and postconference evaluation

C. Parent Postconference Evaluation

1. What information did you receive and was it helpful?
2. What skills did your son/daughter describe?
3. How did it feel to have your son/daughter lead the conference?
4. Did you find the conference to be productive and insightful?
5. Any comments or suggestions?

— REPORT 4 —
WILL STUDENTS BENEFIT FROM DIFFERENT FORMS OF STUDENT EVALUATION?

Russ Wissing

ABSTRACT

During this study, I used different student self-evaluation forms to see if they would produce a variety of positive outcomes. I chose this approach to improve students' accountability for their actions and to make the evaluation process more meaningful to the students.

I teach Pre-Algebra and Algebra I classes in a school system that believes in algebra for all eighth grade students. The students in Algebra I were of varying abilities, and most had experienced difficulty with mathematics in the past. The students in Pre-Algebra had struggled with mathematics, and some of these students had learning or discipline difficulties.

I began the year with the students using a goal sheet to set some expectations for the class and to list some things that they would have to do to excel in the class. They developed a list of good study habits that included such items as come prepared to class, turn work in on time, pay attention, etc. For the first five weeks of the year, I picked one of these study habits per week and asked students to evaluate themselves on how they had performed in class that week. I kept personal observation notes to describe how well I and an aide thought the students were doing on the particular study habit.

Overall, the students were honest in their self-evaluations. The students who were having trouble in class could see a direct correlation between their study habits and their performance in class and on tests.

I used these self-evaluations as a basis for counseling and trying to modify student conduct. As I expected, the Pre-Algebra class took a little more time to focus on the connection between study habits and performance and were more apt to make self-evaluations that I didn't consider justifiable. With guidance and practice, they became better at the process of self-evaluation and at the particular study habit as well. With self-evaluation, student accountability for actions and student conduct improved. In fact, use of a student-self-evaluation form whenever a discipline problem occurred in class, decreased the number of office referrals by one-half. I found that there were two conditions for the effective use of self-evaluation to enhance student performance: Students need to be taught how to evaluate themselves and they need to be evaluated on what they were taught in class.

EXHIBITS - Report 4

A. Sample Form- Self-Evaluation

What grade would you give yourself for being prepared for class this week? A B C D F
What grade would you give yourself for turning in your work when it was assigned? A B C D F
What grade would you give yourself for correcting your mistakes this week? A B C D F

Did you ask a question each time you did not understand a concept this week?
If the answer given by the teacher for a question you asked did not make things clearer, did you ask for further explanation?
Did you come in during access time this week for help in clarifying any problems you were having trouble with?
Do you understand all the concepts that were covered in class this week?
What grade would you give yourself for asking questions this week? A B C D F

B. Sample Form-Student Evaluation of Course Progress

What grade did you put as a goal for this course?
What grade do you think you currently deserve, based on the knowledge of the subject matter covered so far?
How do you rate the job that I am doing as a teacher thus far?
What can I do better to help you learn the subject matter?
What has been going well. What things have helped you to learn the subject matter?
What could you do better to help you learn the subject matter?
What things have you been doing to learn the material and do well in this class?
What grade do you currently have in this class?
Explain the differences between your self-given grade and your current grade.

C. Sample Form-Student Evaluation of Preparedness

1. Did you bring all materials to class each day this week? (book, calculator, 3 ring binder)

2. Did you have all your assignments completed when they were due?

3. Were you mentally and physically prepared to learn Algebra this week? (alert, rested, attentive, enthusiastic)

4. What grade would you give yourself for being prepared for class this week?

EXHIBITS - Report 4

D. Sample Form- Chapter 2 Assessment and Accompanying Evaluations

1. Explain how to add signed numbers.
2. Explain how to subtract signed numbers.
3. Explain how to multiply signed numbers.
4. Explain how to divide signed numbers.
5. Explain how to add and subtract matrices.
6. Explain the distributive property.

In your explanations, make sure you take into account all cases that may occur, give any rules to follow, and justify (explain) your rules. You may use drawings or diagrams and specific problems in your answers.

Teacher Evaluation

1. Addition	0	1	2	3	4
2. Subtraction	0	1	2	3	4
3. Multiplication	0	1	2	3	4
4. Division	0	1	2	3	4
5. Matrices	0	1	2	3	4
6. Distributive Property	0	1	2	3	4

Student Self-Evaluation and Student Peer Evaluation

1. How would you rate the answer to #1, adding signed numbers?	0	1	2	3	4
2. How would you rate the answer to #2, subtracting signed numbers?	0	1	2	3	4
3. How would you rate the answer to #3, multiplying signed numbers?	0	1	2	3	4
4. How would you rate the answer to #4, dividing signed numbers?	0	1	2	3	4
5. How would you rate the answer to #5, adding and subtracting matrices?	0	1	2	3	4
6. How would you rate the answer to #6, the distributive property?	0	1	2	3	4

— REPORT 5 —
SELF-ASSESSMENT AND SELF-ESTEEM WITH PORTFOLIOS

Arlene Gnirk

ABSTRACT

Can students use portfolios to measure their progress in math learning? I conducted this study as a special education teacher in a small class setting. It involved students in the fourth and fifth grades. The research began by my searching through texts and guides for portfolio assessment ideas. My purpose for using portfolios was to improve instruction and student self-esteem. Before my use of portfolios, the special education students were given assignments without any self-reflection or visible signs of progress. With the use of portfolios, students saw progress and experienced an increase in self-esteem.

The students assumed the responsibility for choosing some items to include in the portfolio. Assuming this responsibility demonstrated growth and improvement in math. Possible items for a math portfolio included table of contents, letter to reader of the portfolio explaining selected items, journals, teacher checklists, favorite paper and reason for it being a favorite, paper showing correction of errors or miscalculations, photo or sketch of work with manipulatives, group project, student-generated problem, art work based on math, and notes from an interview. Our portfolios were sent home on a regular basis. The best-work portfolio was in a folder designed and decorated (in artist "Jackson Pollock" style) by the students. Students painted one side of the folder with light blue paint and then sprayed a little black on the blue for accent. The students then used eyedroppers to drip various colors of tempera paint on the covers.

The feedback was positive from both parents and students. Early in the year, students pretended they had met an alien, a space-person from Mars, and told the alien about themselves regarding math and their math abilities. "Dumb" and "not too good at math" were common descriptors. In February, the students looked at some of their earliest papers. Students were impressed by the progress they could see more clearly by comparing work done over a period of time. When they looked at their earliest work, they made remarks such as, "How could I not have known that?" "Didn't I really know how to do that?" "Boy, I've sure learned a lot that I didn't know back then." Later, the students did another introduction of themselves to the alien being. This time they made remarks like "I'm pretty good at math. I am a mathematician and I like math. I've had trouble with math, but I am sure getting it now." One male student introduced himself as "cool." Self-evaluation checklists, informal questioning, and parent conference visits also indicated an improvement in student self-esteem.

I do not believe it is any one thing that supports the value of portfolios, but rather everything put together. I had no great, wonderful transformations of the students from being students who had difficulty learning to students who were gifted, but there was a difference in their learning and self-esteem and that makes portfolios valuable and worthwhile.

EXHIBITS - Report 5

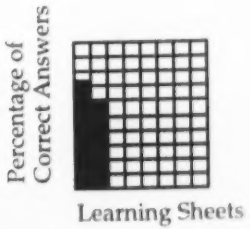
A. Portfolio Forms—About My Portfolio

Describe the assignment (page number or project name).
Why is this assignment part of your portfolio?
_____ My teacher chose it.
_____ Everyone in the class put this into his or her portfolio.
_____ I picked this for my portfolio.

Complete each sentence below.
I began my work by _____
I liked this assignment because _____
Doing this assignment helped me _____

This assignment was:
___ too easy ___ easy ___ hard ___ too hard

B. Portfolio Forms—Multiplication Progress Chart



C. Portfolio Forms—Self-Assessment Checklist

Answer yes, no, or not sure, whichever is closest to your ideas about your own work.

1. Sometimes I don't know what to do when I start a problem.
2. I like mathematics because I can figure things out.
3. The harder the problems, the better I like to work on them.
4. I usually give up when a problem is really hard.
5. I like the memorizing part of mathematics best.
6. There is more to mathematics than just getting the right answer.
7. I think mathematics is not really useful in everyday living.
8. I would rather work alone than with a group.
9. I like to do a lot of problems of the same kind rather than have different kinds all mixed up.
10. I enjoy mathematics.
11. There's always a best way to solve a problem.
12. I liked mathematics when I was younger, but now it's too hard.

Put an X on this scale where you think you belong.

EXHIBITS - Report 5

D. Portfolio Forms—Assessment of an Individual Through Observation

	Frequently	Sometimes	Never
Understanding			
Demonstrates knowledge of skills			
Understands concepts			
Selects appropriate solution strategies			
Solves problems accurately			
Work Habits			
Works in an organized manner			
Works neatly			
Gets work in on time			
Works well with others			
Uses time productively			
Asks for help when needed			
Confidence			
Initiates questions			
Helps others			
Displays positive attitude			
Flexibility			
Tries alternate approaches			
Considers and uses ideas of others			
Likes to try alternate methods, such as mental math or calculators			
Perseverance			
Shows patience and perseverance			
Works systematically			
Is willing to try			
Checks work without being told			

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— REPORT 6 —
STUDENT-TEACHER CREATED VISUAL RUBRICS: MODELS TO GUIDE AND ASSESS RESEARCH PROJECTS

Suzanne Ratzlaff and Rod Diercks

ABSTRACT

The purpose of this research was to study the effects of including students in the design of rubrics that used pictures and words to guide and assess research projects. The questions addressed in this research included: Will a process rubric that is student-teacher created and contains visual representations enhance students' self-directed learning? Will student-teacher designed product rubrics, with pictures and timeline organizers, lead to higher quality research projects? Will developing these rubrics with the students cause them to take more ownership in their projects?

This research was conducted with 38 fourth grade students during three separate research projects. During the first project, all 38 students were given traditional, teacher-generated, process and product rubrics to guide their work. During the second project, the students were randomly assigned to three different groups. Group A was given the traditional process and product rubrics again. Group B was given a traditional product rubric, but worked with a teacher to create a visual process rubric. Group C was given a traditional process rubric, but worked with a teacher to create a visual product rubric. During the third project, all three groups worked with the teachers to create visual process and product rubrics. Data were gathered from rubric scores, conferences, teacher observations, tests, student journal responses and class discussions.

The three groups achieved similar average rubric scores for the first project. When students helped develop visual rubrics for the second project, their average rubric scores increased significantly, while average scores for students with traditional rubrics decreased slightly. The greatest gains in average rubric scores occurred when all students participated in creating and using visual process and product rubrics. Students reported that working together to create the rubrics with pictures helped them better understand the research process and allowed them to achieve higher scores. Students expressed confidence in being able to conduct research on any topic. Teachers observed students asking for more conferences to access their progress during the projects. Students showed more enthusiasm for the projects and often did extra research on weekends.

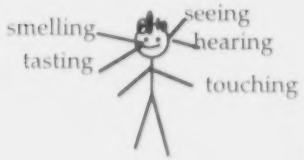
The research showed that when students helped create visual rubrics, their scores improved. To insure that all students benefit from this approach, individual students need to work with the teacher to develop their words and pictures for the rubrics. Conferences with students should be conducted consistently throughout the process. This approach to assessment would work best in a multi-aged setting where teachers could monitor progress over more than just one year and older students could serve as models for younger students.

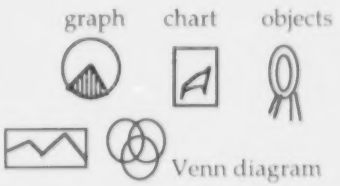
EXHIBITS - Report 6

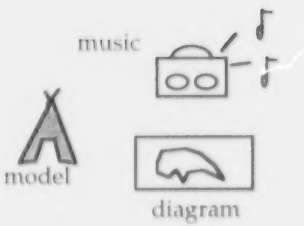
A. Product Rubric

Sensors

Show what you learned.
Show what you have learned with others.



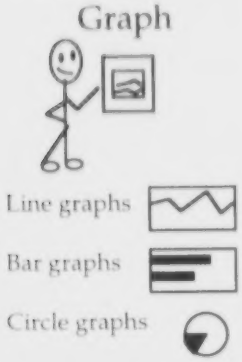




1	3	5
Student's use of sensors does not relate to (go with) the topic. Sensors are hard to understand. They are hard to hear and see. There are many mark-overs and misspellings. Sensors can only be seen or heard five feet away from the presentation.	Student only uses one or two sensors. Parts of the sensors relate to the topic questions. The placement of the sensors does not allow everyone to get information. Most people can see and read, hear and understand the information. Can be seen or heard from 10 feet. Visuals are neatly done. There are not more than two misspellings or mark-overs.	Student uses more than one sensor. These sensors are interesting and relate to the topic and questions. The placement of these sensors allows most of the audience to get more information. Sensors can be seen, read, heard and understood by everyone in the room. Visuals are neatly done. There are no misspellings or mark-overs.

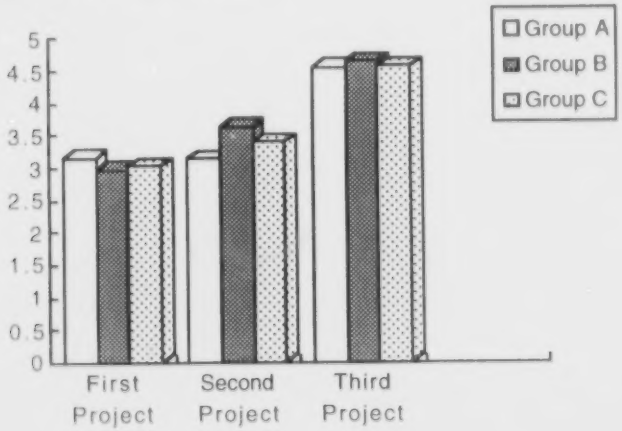
EXHIBITS - Report 6

B. Process Rubric



1	3	5
Graph is hard to read. Letters are light, too close together. Not neat. No title. No question. Graph is confusing. Graph has three or more misspelled words.	Graph can be read from 6 to 10 feet. Information is there but not very clear. Results are unclear. Spacing and size of letters are okay. It is readable. Only 1 or 2 misspelled words.	Graph has a title and question. Graph is easy to understand-- words, numbers, pictures. Neat, easy to read from back of the room (15 feet). No misspelled words.

C. Summary of Process Scores



— REPORT 7 —
GRAND SLAM/BASE HIT/STRIKE OUT

Julia C. Polak

ABSTRACT

Can student-made rubrics increase the level of success on performance tasks? As a seventh and eighth grade science and language arts teacher in a K-8 parochial school, I investigated the writing of rubrics that would reflect "student language" rather than "education-ese." Student performance in both science and language arts tasks increased when students had ownership of the rubrics.

I first used model rubrics gathered from the Nebraska Math-Science Frameworks pilot activities, workshops, and colleagues. I rewrote these rubrics to simplify the language, provide for easy use, and to adjust the expectations for a specific activity. These rewritten rubrics were shared with the students. They rewrote the rubrics in their language, keeping the teacher expectations and, in some cases, making the standards more specific. When writing or adapting rubrics, the students were told to avoid esoteric slang and derogatory or negative language. To be acceptable, the student-developed rubric had to be meaningful to all members of the class and to the teacher.

Written student responses after using the rewritten rubrics were all positive. The students reacted so well to "their" rubrics that they wanted to write rubrics with special themes. The average level of student performance over a six month period on three measured performance tasks increased by 9.8%. The average level of student performance over the same time period on four measured written activities increased by 10.2%.

The research indicated that student familiarity with and ownership of the rubric result in an increased level of student performance. The reason for this increase seems to be that student involvement in writing the rubric in language the student understands leads to an increased awareness of teacher and student expectations. The research also indicated that as the teacher, I became more aware of my own expectations for the task. The students and I both became more focused on the skills, processes, and content pieces addressed by the rubric which resulted in an increased level of student performance.

Rubrics used for assessment of student performance tasks should be shared with the students, and the students should understand what is expected. For students to reach the highest success levels on the performance tasks, they need to have ownership of the assessment instrument, which is best achieved by allowing the students to write their own rubric or to rewrite a teacher-created one. Students will need guidance and helpful suggestions at the outset of the attempt to write rubrics, but the more they are allowed to do, the easier the process becomes for both student and teacher.

EXHIBITS - Report 7

A. Rubric for Arthropod Model and Presentation

	GRAND SLAM 10 pts ea	BASE HIT 8-9 pts ea	STRIKE OUT <7 pts ea
Model Body Parts legs, sections, spiracles, antennae, eyes, mouth parts, *stinger, *wings	all 6 BASES LOADED	4 or 5 STRIKE ONE	3 or fewer STRIKE THREE
Workmanship	well made; looks nice HANK AARON	needs work MICHAEL JORDAN	sloppy job BENCH WARMER
Presentations	one note card for reference BATTING 1.000	written out and read BEANED	no notes or script; winged it ERA=12
Organization	easy to understand well organized HOLY COW!!!	info all there but hard to follow BUNT	huh? FIRE THE MANAGER!
Creativity	neat, new ideas; creative Latin name COOPERSTOWN!!	pretty standard combinations; name not in Latin AA LEAGUE	no original ideas; no name PONY LEAGUE
Teamwork	all worked equally WORLD CHAMPIONS!!	did not participate equally DIVISION CONTENDERS!	one did all the work 14-GAME LOSING STREAK

B. Rubric for 8th Grade Physics Projects

	NEWTON'S APPLE 10 pts	DELICIOUS APPLE 8-9 pts	SOUR APPLE <7 pts
Explanation of Law Demonstrated	obviously understands law; explains as applies to demo	has the right idea; can't explain it adequately	wrong law; attempts explanation
Organization	well organized; easy to understand	basically understandable	huh?
Demonstration Success	correct materials; works well	correct materials; materials failed	substitute materials; didn't work
Evidence of Practice Beforehand	really knows what they're doing	made the attempt	none; winged it

EXHIBITS - Report 7

C. Student Responses to Rubrics

- I liked the rubric because it helped me know what you wanted and helped my grade.
- The rubric chart helped me out a lot because I knew what to do on the report and other things.
- I think that the rubric helped me a lot because I knew what was expected. I knew that if I followed it, it would be a lot easier to get a good grade.
- It made it so I could get a better grade because I could look at it and see what you wanted me to do and how you're grading.
- It helped us so we could go over them and see if we missed anything, then try to work on those things more. This helped our group very much.
- I think this rubric helped our group out a lot. When we read through our presentation the night before, we scaled ourselves. If it was under a ten, we tried to fix it in some way, shape or form.
- I think I liked to be given a rubric sheet because I knew what we had to do to get a good grade. I think it helped us work together as a team.
- It helped our group out a lot because we knew what we needed to have and what we didn't need.
- It's better because we knew how you would grade them and what to expect. It helped because we worked together better when we knew exactly what to do and look for.
- I thought that having the rubric beforehand made writing the presentation a lot easier. It made it easier because I knew what I had to do and how to do it before, so I could get working that much sooner.
- I think that having these guidelines before the project helped because usually we don't know what you want, so we just make the report. Now we follow the guidelines and base our report on that.
- The rubric helped my group because we knew what you wanted. It also made it easier for us because we only got the information we needed and no extra.
- I think the rubric helped me because I know what I can aim for, so I can get a better grade than what I would without it.

D. Researcher Reflections

Rubrics become easier to write, the more one writes them. Models are necessary for new applications. Students need to edit for relevant language. Student familiarity with and ownership of the rubric generally results in better performance.

Common difficulties with rubrics include:

- The rubric may have too many traits to assess for one proficiency.
- The language of the rubrics may be vague and confusing.
- It may be impossible to observe a behavior that would reflect the proficiency.
- Negative language may be used in rubric levels 1 and 2.
- Rubrics may include the use of adverbs and adjectives rather than prepositional phrases and nouns (concrete statements).
- Rubrics may describe behaviors you haven't observed.

— REPORT 8 —
CREATING EFFECTIVE STUDENT-CENTERED RUBRICS

Karen Barry

ABSTRACT

This research focused on creating effective student-centered rubrics to enhance learning in the classroom. Fifty fifth graders were involved in this research. Over the course of the research, the students developed several rubrics, learning new lessons about rubrics each time. Students kept narrative journals that included their definitions, ideas, reflections, and frustrations; teacher's reflections; and parental reactions.

The first rubric we used was teacher-created. Its use demonstrated that students need directions that are measurable and not too detailed. A very detailed description was too involved for students to understand. The second rubric was developed with student input. The second rubric allowed students to develop their work in draft stages. Individual conferences were scheduled to check for student understanding and to encourage hard work. After each project was completed, each student evaluated himself/herself numerically. After using the second rubric, we decided that the third rubric should include numerical criteria and qualitative descriptions. Our fourth rubric was more involved than our previous ones and required students to work harder to score well. The rubric would be used to assess a brochure that the students would develop. To determine the criteria that should be included in the rubric, the students looked at several sample brochures. They listed all the details that they felt were important or eye catching. Students then worked in groups to create the rubric. Their rubrics were presented to the class with pictures to enhance understanding. Students wrote a reflective paragraph about the unit we studied and used the rubric to rank themselves numerically.

Originally, the intent was to have students create their own unique rubrics, but I discovered that group-developed rubrics can also provide room for creativity and individualism. Evidence showed that students cannot be expected to create a rubric if they don't have a model or enough background knowledge to establish criteria for quality work. The study also supported the idea that students who are involved in creating rubrics understand them better and feel a sense of ownership and pride in their work. Further investigation indicated that self-evaluation needs to become a valued aspect of student learning. When students write about their work, they become more reflective and produce better work.

I learned several other lessons from this research including the idea that conversations between students about work don't necessarily lead to copied work. In fact, conversations can spark creativity. Another lesson I learned was that allowing students to complete their work in draft stages provided information for assessment, assured success, and increased communication and motivation. I also found that students understood directions more clearly if they were asked to illustrate them. It was evident from the research that students are not motivated if they are asked to perform at the lower level of Bloom's Taxonomy. Rather, students find themselves meeting challenges if teacher expectations are raised to the level of application. Challenging expectations and communication are the keys to student learning. As one student summarized, "Rubrics are guidelines to our imaginations."

EXHIBITS - Report 8

A. Student-Created Rubrics - Planet Brochures

Criteria	6	5	4	3	2	1
Historical information must be included.		Create a flag with symbols and colors that describes the history of your particular planet. A historical summary must be included in paragraph form. (3-5 sentences).		Create a flag with symbols and colors that describes the history of a planet. The historical summary will be shown using a key.		Create a flag with color and symbols that describes the history of your planet.
Your means of transportation must be included.		Show in a blueprint the control area, eating area, exercise area, and sleeping area. Each area must include three essential items. For extra credit, make a probe that is designed to land on your planet.		Show three rooms in the shuttle with three specific items in each area.		Show two rooms in the shuttle with three specific items in ea[illegible] area.
You must include past and present information on weather terms.		Discuss five weather terms: temperatures, storms, seasons, dry or wet, gas giant, terrestrial, atmosphere, natural disasters, or pressure.		Discuss three or four weather terms.		Discuss two weather terms.
You must include attractions or landmarks.		Four places to go and three main ideas to tell about each landmark. There's a key to describe where the landmarks are. Use at least six colors.		Three places to go and two main ideas to tell about the landmarks. There's a key to describe where the landmarks are. Use at least four colors.		Two places to go and two main ideas that tell about the landmarks. There's a key to describe where the landmarks are. Use two to three colors.

EXHIBITS - Report 8

B. Student Definitions of Rubrics

- Think a rubric is a set of standards to which we compare ourselves. A rubric helps achieve more than we would without it. I like that a rubric makes you work.
- Rubrics make it easier to do our work, and easier for us to grade ourselves.
- Rubrics keep us on track. They help us to see how we are progressing.
- Something that helps us do our work better so we know your expectations.
- Develops our imagination to go above and beyond what we want to do.
- Allow us to create ways to make us have more fun.
- Rubrics are guidelines to our imaginations.

C. Student Comments on What They Learned From Rubrics

- We learned that we can do a better job if we check over our work.
- We know that we do much better if we know what's expected.
- We should continue to do rough draft-final copy because you can think of more things in between.

D. Student Responses to Which Rubric They Liked the Best and Why

- We liked the planet brochure because we got to pick more. We got to pick which weather terms we wanted to talk about. We got to pick which planet we wanted to travel to. We got to pick which landmarks we wanted to visit.
- I liked this project best because you didn't tell us exactly what to do. We got to go above and beyond. You didn't limit us to just 5 points. We could do as much as we wanted to. I really liked that we could do more.
- I liked the planet brochure best. I think I got a perfect score because I tried hard, listened to directions, and followed the rubric. I think the project was fun because we could create almost anything while we were learning. While doing the project we discovered things about the planet we were studying, the planets, moons, and other planets, and cool facts about our galaxy. If you can travel in your mind to outer space, you can do almost anything!
- I liked this chapter because we did different things that I like. I liked this rubric because it was very organized. It also told me exactly what I needed to do.
- I liked the rubric because it was challenging, exspective, and you had to work very hard to do well. (Student definition of exspective is "If you expect us to give you more, we will.")
- I thought the planet brochure was pretty fun. I like to help make the rubric because it is in kids' words of talking instead of big words we don't know. Thank goodness, or I could not read them. I'm not good with big words.

— REPORT 9 —
USING RUBRICS TO ASSESS STUDENTS' WRITING IN MATHEMATICS

Kim Potter

ABSTRACT

The purpose of this research was to see if fourth grade students could communicate their thinking while writing how they solved specific math problems. A second purpose was to stimulate practical application of new math problems. The question addressed in this research was: When students can demonstrate their thinking and understanding of math concepts in various formats, will their practical application of math improve?

The research was conducted with eighteen fourth grade students during the regular math class. Students were given a teacher-made rubric with the following five sections: topic and question, information I already know, computation, strategy used to solve the problem, and practical application. The rubric was scored with a 5 being the highest and a 1 the lowest.

Students were given a problem to solve. Then they were given an opportunity to demonstrate their understanding by verbalizing answers, manipulating objects, drawing a visual representation of how they arrived at their answer, writing explanations in their own words, computing, and illustrating applications. The topics integrated current events with specific skills from the math text. Topics for problem solving in this research were the following:

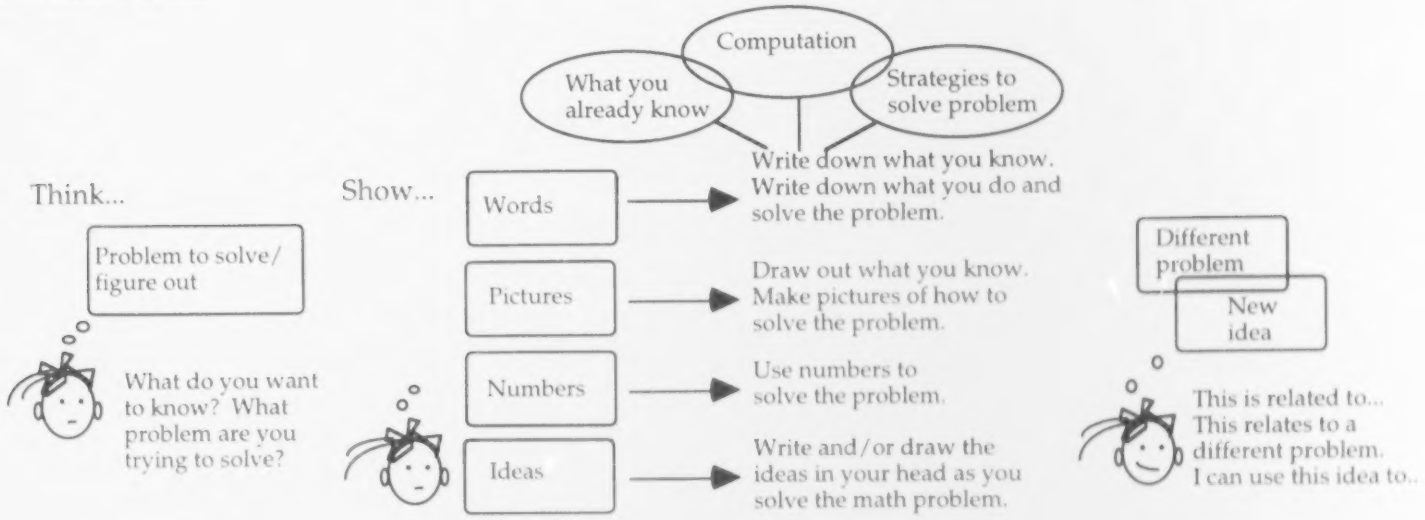
How many days until the 100th day if 25 days have passed?
When was Ms. America born?
What are fact families?
What is rounding?
What does .5 mean on the odometer?
How many days until the 100th day if 50 days have passed?
What is multiplication?

Students were given as much time as needed to complete each activity. Teachers used the rubric to score the students' writing. Collected data came from the rubrics, chapter tests, student comments on homework, observation, student surveys, and videotaping. Rubric averages and writing continued to improve with each new activity. The highest class average was on rounding, but this may be explained by the fact that the students were able to share their words for rounding before doing the activity. Class averages from the textbook chapter tests were a few points higher than those of another class the previous year.

I concluded that students can write in math, and when students do use their thinking to write and problem solve, their practical application improves. I also concluded that when students are given a rubric in which they know what is expected in order to receive a top score, they will work their hardest to receive that score.

EXHIBITS - Report 9

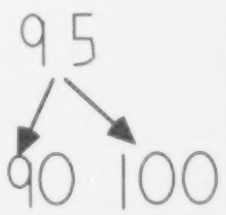
A. Lesson Format


Computation
What you already know
Strategies to solve problem
Write down what you know. Write down what you do and solve the problem.
Think...
Problem to solve/ figure out
What do you want to know? What problem are you trying to solve?
Show...
Words
Pictures
Numbers
Ideas
Draw out what you know. Make pictures of how to solve the problem.
Use numbers to solve the problem.
Write and/or draw the ideas in your head as you solve the math problem.
Different problem
New idea
This is related to...
This relates to a different problem.
I can use this idea to..

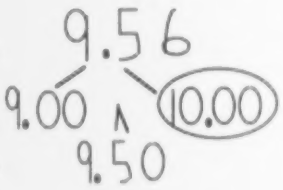
B. Student Writing Sample

Our topic is rounding. Our question is, "What is rounding?"
I know that when you round, in the ones place, 1-4 = the lowest number and 5-9 = the highest.

An example would be :
What you do is you see what number you have in the ones place and it is a 5. So you remember that if you have a 5-9 in the ones place, you go to the highest number. So your answer is the highest number which is 100.



A story problem that goes with this is: Bob goes to the store and sees a basketball for $9.56. He has $10.37. He rounds $9.56 to the nearest dollar. Does he have enough? Yes.



74

75

EXHIBITS - Report 9

C. Rubric Sample

	1	2	3	4	5
Topic and question	Student unable to think of a question. Teacher had to assign a question.		Student had a question but did not relate to the problem.		Student's problem included a question. Question explained what student wanted to know.
Information I already have to work a problem I know!	Student did not remember or write down any information about the problem.		Part of information was included; still missing part of the information.		The problem included all the information needed to do the steps.
Computation with operation +, –, x, ÷, <, >, = and labels.	Student unable to do any computation.		Problem was set up correctly, but operation was incorrect. Answer was not accurate.		Student knew what to do with information. Computation is correct.
Strategy: Explain how you solved the problem. First, next, then, if, so, subtract, etc.	Student could not write his/her own explanation how to solve the problem.		Student attempted writing how they solved the problem but parts of the meaning were missing.		Student's thinking and true meaning of how the problem was solved were shown with correct language.
How can I apply or use this skill to solve another problem?	Student could not use this skill to think of another problem using same skill.		Student could come up with problem but couldn't solve correctly.		Child related own story problem and came up with right answer.

— REPORT 10 —
USING MULTI-MODAL ASSESSMENT FOR HANDS-ON SCIENCE ACTIVITIES

Shane Gallagher

ABSTRACT

The research focused on assessing hands-on science activities using a multi-modal approach to assessment. My questions were: What kinds of information would I get when using pictorials or journaling as a means of assessing activities? How effective is multi-modal assessment during hands-on science activities? In this research, multi-modal refers to one of the choices students were given to display their knowledge: drawing pictorials only, journaling, combining pictorials and journaling (multi-modal), or choosing the teacher's pictorials. The majority of the students chose the multi-modal approach to display their knowledge. Few students chose one type of assessment one time and then a totally different type for the next activity. No students chose the teacher's pictorials. The student sample consisted of five girls and five boys from the 6th grade. Throughout the research project, students were engaged in many hands-on activities such as creating a mitosis model and explaining the difference between mixtures and solutions. Before they chose their approach to display their knowledge, students had to think about the objectives and the concepts that they were trying to meet. Students' self-assessments were submitted after each activity. I used checklists to determine student understanding of the concepts and objectives and an evaluation scale to measure completion of the objectives. I plan to continue to refine both of these tools.

When students were confronted with changing evaluation methods, fear of the unknown appeared in their eyes. They were so accustomed to taking the traditional tests, that any change was frustrating. After a lengthy discussion about the different options, students seemed to be more at ease. As the project continued and they became familiar with their own particular learning styles, they seemed to be more comfortable with the assessment process. As the comfort level increased, so did the quality of work. In comparing the very first self-assessment with the last self-assessment, I concluded that with practice, students become comfortable with the process and are more likely to attain the concepts and objectives than they would be without the process. One student commented, "This sure is a lot harder than the other tests, but I like these better."

Students tended to guess less at answers and to use more process skills through this assessment method. This approach also seemed to address more learning styles and to broaden students' ways of thinking. When students were given assessment options, and were not confined to the limits of traditional assessments, they performed beyond the activity objectives. Student-selected assessment created an environment of student ownership; they appeared to realize more fully that they are accountable for their own learning.

EXHIBITS - Report 10

A. Observation Checklist

Teacher: _____
Target Skills: _____ Ratings: + = frequently ÷ = sometimes 0 = not yet

Name	Comparing	Concluding	Listing	Identifying	Comments

B. Evaluation Scale Example

Name: _____ Date: _____

Class: _____ Assignment: _____

Check One Type of Assessment: ____ Self ____ Group ____ Teacher

1. Criterion: Separate mixtures

1 _____ 3 _____ 5
1 of 3 — 2 of 3 — screens, evaporation, & filters

2. Criterion: Describe the difference between mixtures and solutions

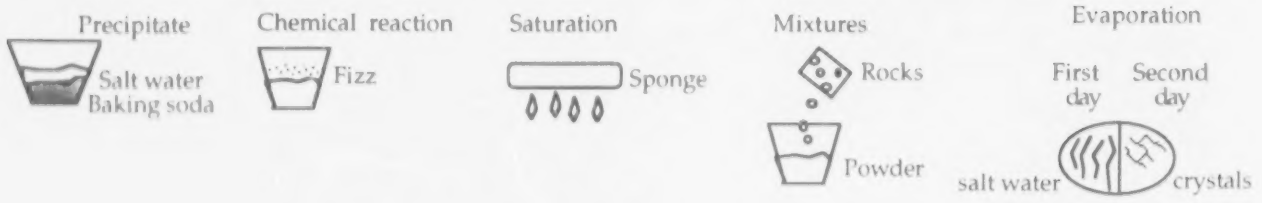
1 _____ 3 _____ 5
describes, but does not identify — describes, identifies one — describes and identifies both

3. Criterion: Understand the concepts of saturation

1 _____ 3 _____ 5
describes concepts partially — describes majority of concepts — describes solubility and saturation

EXHIBITS - Report 10

C. Student Journaling and Pictorial Samples



Saturation: Saturation is when you put salt or citric acid in a bottle and it can't hold any more.

Solution: One kind of solution is salt and water because you can't get them separated.

Mixtures: A mixture is sometimes used in food, like Koolaid and cookies.

Dissolve: What is another word for dissolve?

A. Soluble
B. Citric acid
C. Mixture

Cell: A cell is the smallest living part of an organism. The two kinds of cells I will write about are the plant and animal cell. These are alike and different in many ways.

First, both have a 1) nucleus, chromosomes and genes. The nucleus is like the cell's control center, but the 2) genes and 3) chromosomes control the cell's movement. Second, both have 4) cytoplasm and 5) vacuoles. The cytoplasm is a clear material that protects the nucleus. Vacuoles are like the cell's digestive system, in that they hold food for the cell and let out waste the cell doesn't use or need. Next, they both have a 6) cell membrane which controls things that move in and go out of the cell. It also protects the entire cell.

Although these cells seem very much alike, there are some things that the plant cell has that the animal cell doesn't. The three things are chlorophyll, chloroplasts and a thick cell wall. Chloroplasts are small bundles of chlorophyll which is the green coloring matter in plants and tree leaves. The cell wall is a thick outer coating on a plant cell protecting it.

— REPORT 11 —
STUDENT SELF-MOTIVATION FROM STUDENT-TEACHER ASSESSMENT OF A SIXTH GRADE MATH SKILLS CHECKLIST

Guy R. Roggenkamp

ABSTRACT

This investigation reviewed the agreement or disagreement between sixteen sixth grade self-assessment checklists and teacher checklist assessment of the same student work. I then investigated the differences and worked toward more agreement between the two assessments.

The students evaluated themselves seven times during the year, and I evaluated them each of these times on a separate sheet using the same checklist. Both the students and I wrote summaries to accompany the checklists and placed the individual student on a positive to negative "I'm good at mathematics" scale. I then conferenced with each student and we compared our checklists. Evaluations were marked for excellent, satisfactory, and needs improvement. During the student-teacher conference, we found agreement, partial agreement, or no agreement. We discussed the idea that agreement should not mean acceptance or satisfaction with the performance. Sometimes students showed high marks and I had low marks. They often explained this by saying they had little knowledge of a particular skill the previous year and now they did. I realized that some students saw themselves doing very good work in some things and were satisfied even if that was not the level at which their parent or I thought it should be. Some students felt they could justify their scores and saw no need to improve.

In most cases, the student and I agreed or had partial agreement. Generally, the students had their math portfolios with them to justify the markings or to realize how they could do better.

Reviewing the student checklist during parent-teacher conferences helped the parents to see improvement in the child's math knowledge. If the student was in attendance at the conference, the student led the discussion of the math portfolio using the checklist to reinforce what was said.

To help students understand the math skill checklist better, I will be refining the way in which I present the skills to the students. I feel that having some students role play certain skills will help. More detailed class discussions of the skills will help give students greater ownership of the process. Many students and parents have commented that they are more aware of the math skills than before.

EXHIBITS - Report 11

A. Math Checklist of Skills - Seven Evaluations

_____ student _____ date

E = excellent S = satisfactory N = needs improvement

Uses problem solving method:	I	II	III	IV	V	VI	VII
1. Explore							
2. Plan							
3. Solve							
4. Review							
Able to explain work							
Communicates mathematically							
Understands mathematical directions							
Knowledge of basic facts (five minute test)							
Demonstrates proper use of calculator							
Has understanding of math terms.							
Able to formulate a problem using proper methods after discussion							
Able to work alone							
Able to work in groups							
Completes extra credit							
Participates in class discussions							
Displays neatness							
Uses examples and class work to solve work							
Shows interest in math							
Hands work in on time							

Locate yourself on this scale:

I'm not good at mathematics. ——— I'm good at mathematics.

I. Student comments: _____

II. Student comments: _____

III. Student comments: _____

IV. Student comments: _____

V. Student comments: _____

VI. Student comments: _____

VII. Student comments: _____

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EXHIBITS - Report 11

B. Math Portfolio Daily Critique Sheet

Date: _____

I see myself doing well on:
1. _____
2. _____
3. _____

What I need to improve upon.
1. _____
2. _____
3. _____

Date: _____

I see myself doing well on:
1. _____
2. _____
3. _____

What I need to improve upon.
1. _____
2. _____
3. _____

Summary:

— REPORT 12 —
SELF-ASSESSMENT ACTIVITIES TO IMPROVE STUDENT PERFORMANCE

Brenda Charles

ABSTRACT

This study examined how self-assessment activities bring student and teacher evaluations closer together. In 1992-93, our school district began writing outcomes and designing sample assessment tasks and units of instruction for the district. In 1993-94, the assessment tasks and rubrics were piloted in several schools. Our school piloted the tasks that were designed for math assessment in grades 4, 7, and 8. The rubrics used for these tasks were generic and not very specific. The evaluations were to be done by a peer, adult, student, and a teacher committee. In the majority of cases, the peer, adult and student evaluations were very different from the committee's evaluation.

The self-assessment activities that I chose to use with my students were incorporated into portfolios, student-checked papers, pretests, and rubrics. Portfolios and student-checked papers were activities already used in the classroom, but the emphasis was changed to student self-evaluation of work rather than correcting papers just for a grade. I used pretests and rubrics to introduce goals and evaluation criteria to the students who were then able to set their personal goals for the unit. Pretests were used for textbook activities; rubrics were used to communicate goals and criteria for other activities.

Data were gathered from the activities using observations, student writings, and test results. The information was analyzed to assess the agreement between student's actual performance and perceived performance and for signs of change and growth in student attitude, understanding and achievement.

These self-assessment activities have allowed students more control in their evaluations. Some of the burden of reteaching and redoing has been removed from the teacher and placed on the student. As shown by Exhibit D, the pretest averages improved. I believe the increase reflects a changed attitude of the students. They now take the pretest more seriously and perceive it as a true self-assessment and a personal goal-setting tool. The portfolios allow students to reflect about what they have accomplished. The students and I are communicating better about grades and mathematics. When using a good rubric, the student evaluations and my evaluations are beginning to come closer together. Students are allowing themselves to make mistakes during the learning process while at the same time feeling good about themselves. Students seem less hostile to a less-than-excellent grade because they view it as an opportunity to learn. "Practice makes perfect" has become a motto in our classroom.

EXHIBITS - Report 12

A. Rubric for Rocket Car Activity

Excellent:
Car Design and Construction:
1. Car is complete and does move.
2. Student successfully recognizes problems and uses correct procedures to correct the problems.
3. Student competes in race and follows directions.

Newton's Laws of Motion:
1. Student recognizes how the laws of motion relate to his/her car.
2. Student responses to the questions are correct and are supported.

Good:
Car Design and Construction:
1. Car is complete but does not move.
2. Student successfully recognizes problems but uses incorrect procedures to correct the problems.
3. Student competes in race but does not follow directions.

Newton's Laws of Motion:
1. Student does not recognize how all the laws of motion relate to his/her car.
2. Student responses to the questions are correct but are not supported.

Unsatisfactory:
Car Design and Construction:
1. Car is not complete.
2. Student does not recognize problems and does not use correct procedures to correct the problems.
3. Student does not compete in race and does not follow directions.

Newton's Laws of Motion:
1. Student does not recognize how the laws of motion relate to his/her car.
2. Student responses to the questions are incorrect and are not supported.

EXHIBITS - Report 12

B. Rubric for Physical Education, First Quarter

Miles:	Excellent:	Student completes more than 8 miles.
	Good:	Student completes 6 to 8 miles.
	Satisfactory:	Student completes 4 to 6 miles.
	Unsatisfactory:	Student completes less than 4 miles.
Communication:	Excellent:	Plan and implement a family conditioning activity.
	Good:	Completes 2 of 3 steps.
	Satisfactory:	Completes 1 of 3 steps.
	Unsatisfactory:	No planned activity done.

C. Student Corrected Papers

Question: How do you view grading your own papers?

- I learned what I did wrong or differently.
- I don't look at returned papers.
- I learn if I'm having trouble.
- I'm finding and correcting my own mistakes.
- If the teacher grades the paper maybe my formula is wrong; if I grade, maybe I've copied the numbers wrong.
- It's easier for me to understand what I did wrong.
- I'm learning what I did wrong.
- Teacher learns if I'm having trouble if the teacher grades.
- I really need help or I'm going to flunk this test.

D. Pretest Results

Students	2nd Qt Average	3rd Qt Average	Change
A	55	80	25
B	65	85	20
C	70	79	9
D	55	55	0
E	70	80	10
F	55	80	25
G	77	95	18
H	55	83	28

— REPORT 13 —
SELF-ASSESSMENT IN THE 9TH GRADE SCIENCE ROOM: A USABLE DOCUMENT AND RELATIONSHIP TO LEARNING

Linda S. Graham

ABSTRACT

The main focus of this research was to develop a usable self-assessment document for ninth grade biology students. The investigation also explored any connection between self-assessment by the students and increased student learning. Four sections of biology students were given weekly self-assessment forms to complete and return to the teacher for inclusion in their portfolios. The form was changed monthly, and students completed the same form at least four times within each month. Close to the end of the semester, they were given a blank sheet of paper to design and fill in their own self-assessment. At the end of the semester, they were given a form that was mostly blank, with specific categories in which they could give information. Their final assessment asked them what they would like included in self-assessment documents.

The students gave most of the feedback on what would make a usable form. They did not want a blank or mostly blank form. They preferred a form that gave very definite items and allowed them to circle a place on the continuum where they felt their talents and abilities were at the current time. The form they preferred included items on understanding and concepts, working cooperatively, completing assignments on time, exhibiting good social skills, following rules, and comparing the student's assignment of a grade to the teacher's corresponding assignment of a grade. Suggestions for use on future self-assessments included: What would you as a student desire to learn? What wasn't learned? Why were the things studied important? What do you feel the teacher needs to teach more about? Is the teacher teaching to my learning style? Do you as a student think you are doing well and if not, why not? Do you have suggestions or comments? How does your behavior as a student affect the learning of others?

Throughout the semester, students looked at the grades they felt they should receive versus the posted grades. At the end of the semester, half the students agreed with the posted grades and half disagreed with the posted grades. Of the half that agreed with the grades, a little over half had a grade of A. Of those that disagreed, all wanted a higher grade and gave justifications that varied from getting a good grade on the very last test to behaving well in class all semester. I felt the research was inconclusive over a one semester period on the use of self-assessment to increase student learning. There may have been increased student learning, but it was not apparent when measured by the grades.

I hope that these students will think about the self-assessments and, consciously or subconsciously, use a form of self-assessment to measure and increase their own learning as they continue in their studies.

EXHIBITS - Report 13

A. Student Preferred Self-Assessment Form (second month)

1. I understand the concept of _____.
2. I understand the concept of _____.
3. I understand the concept of _____.
4. I work cooperatively with the others in my group or at my table.
   1 2 3 4 5
5. I complete my assignments on time.
   1 2 3 4 5
6. I attempt to find answers to questions myself using various means before I ask.
   1 2 3 4 5
7. I try my hardest to use good social skills, especially the targeted one.
   1 2 3 4 5
8. I follow all classroom rules.
   1 2 3 4 5
9. I feel my grade for this week's work should be—
   1 2 3 4 5
10. I think the teacher would probably give me the following grade for my work and attitude/behavior:
    1 2 3 4 5
11. Please rate this self-assessment document on a scale of one to ten, with one being the worst and ten the best.
12. Rate the first self-assessment document using the same scale.

EXHIBITS - Report 13

B. Least Preferred Self-Assessment Form

1. What went very well this week?
2. What did you learn this week?
3. What did not go well and/or what did you not understand?
4. My social skills for the week are: (circle one)
   I couldn't do much better.
   I did okay, but I could still improve more.
   I really need to work more on this.
5. The social skill(s) that was/were targeted for this week was:
6. I feel like I should receive the following grade for this week's effort. This includes both scholastic work and social skills. (Circle the one that you feel most applies to your work and effort.)

A B+ B C+ C D+ D F

C. Sample Assignments and Rubric

Cell Theory (pages 79-80)
To turn in:
1. State the 4 parts of the cell theory.
2. Give the contributions of Hooke, vanLeeuwenhoek, Schleiden, Schwann, and Virchow.

Assessment:
* Can state all 4 parts of the cell theory and give each person's contribution toward its development.
0 Can state at least 3 of the 4 parts of the cell theory and give the contribution of 4 of the 5 men.
\# Can only state 2 or fewer parts of the cell theory and give the contribution of 3 or fewer of the people involved.

D. Researcher Reflections

The majority of the students stated that the self-assessments had helped them in some way and felt that the assessments ought to be continued next semester. The format of the assessment for this level of students needs to be fairly simple. It should include an area about student conceptual learnings, an area for how they learn and time spent learning, an area for social skills and behaviors, and an area for their actual grade. There should always be space left for them to write in anything they wish to write about themselves. Most students stated that the self-assessments made them more aware of what they had been learning, but, at this point, I have no proof that the learning level was elevated by using the self-assessments.

— REPORT 14 —
USING CHECKLISTS TO IMPROVE STUDENT SELF-ASSESSMENT

Stephen Hamersky

ABSTRACT

My physics students did not seem to self-assess their work on projects. They submitted projects with major flaws even though project guidelines clearly described what was to be done. The goal of this investigation was to discover if self-assessment checklists would stimulate improved student performance. Since I occasionally use checklists to assess projects, I decided also to give the evaluation checklists to students along with the project guidelines in two of three project situations. The students were encouraged to assess their own work and work of other students in the second situation. I used the same checklists to evaluate their projects in each of the three situations.

The study was conducted with first year physics students from the junior and senior classes. Laboratory reports and exploration activities were used in the three projects selected for the investigation. For the first project, students were not given the checklist prior to the activity but had to rely on the guidelines only. The students scored poorly on the activity as assessed by my checklist and were given an opportunity to correct mistakes and resubmit their work. For the second and third projects, students were given the checklists in advance of the activity. For the second project, the students evaluated themselves and their peers using the checklist. For the third project, only I evaluated the students with the checklists. Some of the errors made on the first activity were not repeated on the other two projects. When students had the checklists in advance, they scored better on their projects.

After completing the third project, students were given a survey to determine their attitudes toward the project guidelines and self-evaluation checklists. Students had mixed feelings about how easy the projects were, but they seemed to agree that the checklists were helpful. Students reported that the checklists gave them a compact list of the important items that should be present in the final project reports. Students felt that the guidelines were less clear than the checklists. They expressed mixed feelings about using the checklists for self-evaluations and peer-evaluations, however.

For teachers, checklists make grading easier, faster, and more consistent. For students, checklists help improve performance because they indicate what is expected, particularly if each item addresses both quality and correctness. Although checklists appear to be an excellent way to help the teacher evaluate student projects, I believe project guidelines and directions are still important since guidelines give a detailed explanation of the steps to follow, the requirements, and the results expected in a project.

EXHIBITS - Report 14

A. Survey Results

Circle one number for each question.	Disagree 1	2	3	4	Agree 5
1. This activity was easy.	1	2	3	4	5
2. The checklist was helpful.	1	2	3	4	5
3. The direction sheet was clear.	1	2	3	4	5
4. The self-evaluation was helpful.	1	2	3	4	5
5. The peer evaluation was helpful.	1	2	3	4	5

Question 1	13%	32%	28%	22%	5%
Question 2	0%	0%	17%	35%	48%
Question 3	0%	13%	37%	33%	17%
Question 4	3%	7%	27%	33%	30%
Question 5	8%	8%	23%	30%	30%

The students also were asked what grade they felt they would receive on the second project. The average grade prediction was 94% and the actual class average was 96%.

B. Project Grades

Project 1: average 30.75 out of 35 total points (initial grading)
Project 2: average 14.47 points out of 15 total points
Project 3: average 14.66 points out of 15 total points

EXHIBITS - Report 14

C. Project 3 - "Trip to School" - Guidelines and Checklist

As you drive to school, record the odometer reading every few minutes. Collect at least 6 data points and explore the data.

1. Complete the data table below. Use your own data, or the data from someone else. List the name of the person collecting the data. (Sample data were given in a table organized as shown below.)

Time (minutes)	Odometer (miles)	Distance (miles)	Change in Distance	Change in Time	Speed (miles/min)	Speed (miles/hour)

2. Give the equation used to find distance, speed, change in distance, and change in time.
3. Write a paragraph that describes the motion of the car. When is the car going the fastest? When does it go the slowest? Discuss the speeds with the person that took the data. Why does the speed change? (sample story to accompany the data)
4. Graph the data using a line graph. Label the axes with words, numbers, and units. Give the graph a title.
5. Write a paragraph that describes the graph. How do the motion of the car, the speed and the slope of the graph relate? Consider at each segment of the graph. What does the graph look like when the car is going fast? going slow?
6. Draw the rise and run triangles on the graph for each segment. Using the triangles, find the rise (miles), run (minutes), slope (miles/min), and the slope (miles/hour).
7. Write a paragraph conclusion that addresses each of the following:
   Compare the speeds and slopes. How are they related? Write the slope equation for two points. Explain how you use the slope formula. Write the speed equation for two distances and two times. Explain how you use the speed formula. What was one thing you liked most about the activity?

Checklist:

_____ First data table complete; significant figures are reasonable.
_____ First data table calculations are explained.
_____ First paragraph contains details that explain the shape of the distance vs. time graph.
_____ Second paragraph connects the speed with the slope of the graph.
_____ Second data table complete; significant figures are reasonable.
_____ Conclusion relates speed and slope.
_____ Conclusion gives formulas for slope and speed.
_____ Conclusion gives likes and dislikes.
_____ Graph neatly drawn.
_____ Graph properly labeled.
_____ Graph shows rise and run triangles between the data points.

— REPORT 15 —
IN A STATE OF CHANGE

Dot Snesrud

ABSTRACT

The Nebraska Mathematics/Science Frameworks was developed to provide guidance, support, and leadership to enhance mathematics and science learning for all students in the state of Nebraska. Teachers were involved in writing the document which includes model lessons and assessments that exemplify the Frameworks. These teachers presented the activities and document to other teachers at nine sites across the state in August of 1994. A colleague, Lenny VerMaas, and I were hired for the 1994-1995 school year to continue presenting the Frameworks and to complete follow-up workshops on assessment for the original nine sites.

This research assessed the impact of Frameworks knowledge on teachers' actions in the classroom. My research questions included:
- How has the Nebraska Frameworks influenced teachers in the classroom?
- How have the writing team members changed their teaching strategies and classroom environment?

Data were collected from a survey sent to a random sampling of persons who have a copy of the Frameworks document. Sixty-one of 282 surveys were returned, 77% female and 61% elementary. The survey asked participants to describe the goals of a lesson, their teaching methods and strategies, their interaction with the students, their method(s) of assessment, and their background knowledge of seven educational philosophies. The level of involvement in the Frameworks varied among the respondents. Other data were collected from personal interviews, from exit cards submitted by participants at various workshops, and from observations of teachers during workshops.

Sixty percent of the respondents described activity-based lessons. Most of those activities used cooperative learning strategies and/or class discussions. The ten percent who used lecture as the focus for their lessons were senior high teachers. There were many kinds of assessment being used, but observation was the most frequently used method. Students' verbal explanation and/or demonstration, a finished product of some kind, and a traditional test or quiz were also used. Constructivism was the least familiar philosophy. Alternative assessment seemed to scare and overwhelm many people.

By noting the different responses and experiences of survey participants, I made these conclusions from the collected data:
- Change is more likely if the topic is revisited, expectations are given, and time is provided for sharing and reflecting on practice.
- Change is more likely if the same group is brought together several times during the school year.
- Teachers vary considerably in their knowledge and implementation of educational reform and assessment practices.
- It takes time to effect change.
- Teachers need to actively participate in and have time to practice new strategies before they use them in their classrooms.

EXHIBITS - Report 15

A. Survey

I was involved in Math/Science Frameworks through:
__ team member __ three day workshop __ one day workshop
__ other (explain) _____
Please list the Educational Service Unit in which your school is found.
I am ___ female ___ male. I teach _____grade(s).

1. I'd like you to think about one of your typical lessons in math/science that you have done in the last two weeks, and describe it. As you think about the lesson, think about your goals for the lesson, your teaching methods, your interaction with students, and your methods of assessment.
   GOALS -
   METHODS-
   INTERACTION-
   ASSESSMENT-
2. If you had to describe your philosophy of teaching mathematics and science in a few sentences, how would you describe it?
3. Would you say your teaching philosophy is about the same or different now than it was a year ago? If different, what is the main way it is different?
4. Do you feel being involved with Frameworks changed your teaching? If yes, how?
5. Do you perceive students benefiting from your use of Frameworks to plan your lesson? If yes, how?
6. I have tried ___ activities that I experienced or helped write in a Mathematics/Science Frameworks workshop. Please give a close approximation of the number of activities.

Please check one box for each area to show your understanding of the following educational philosophies.

Areas	Not Familiar	Aware	Use in Classroom
Outcome Based Education			
Constructivism			
Integration			
Cooperative Learning			
National Mathematics Standards			
National Science Standards			
Authentic Assessment			

EXHIBITS - Report 15

A. Survey Continued

Use the following scale to rate these items:

1-seldom like me or my classroom
2-sometimes like me or my classroom
3-often like me or my classroom
4-very often like me or my classroom

1. My students come up with solutions I hadn't thought of but are correct.
2. We do mostly paper and pencil activities during math and science class.
3. Our classroom is a place to explore questions and strategies to solve problems.
4. I share my understandings of concepts and activities before the students share their understandings.
5. My students gather and interpret data and then draw conclusions from the results.
6. I use student interests and experiences when planning classroom activities.
7. I do most of the speaking in my math and science classes.
8. When asking questions, I allow five to ten seconds of wait time before I expect an answer.
9. I use the textbook as the primary resource for teaching math and science.
10. The Frameworks has helped me feel more confident in my teaching of mathematics and science.
11. My students usually work independently and have very little contact with other students.
12. Students are encouraged to elaborate on their initial thoughts and responses.
13. I use the math and science Frameworks charts to plan and keep track of my activities.
14. I focus on two or three process skills from the Frameworks in each mathematics and science activity.
15. Higher order thinking skills such as analyzing, classifying, predicting, and synthesizing are common in our classroom.
16. I show students how mathematics and science connect with other subject areas.

B. Results from Above Portion of Survey

Item	Team	3-Day	1-Day	Other	Ideal	Item	Team	3-Day	1-Day	Other	Ideal
1	2.9	2.7	2.7	2.7	4	9	2.1	2.4	3.1	2.2	1
2	1.8	2.1	2.4	1.9	1	10	3.5	3.1	1.8	1.8	4
3	2.9	3.4	2.7	3.4	4	11	1.1	1.3	1.2	1.1	1
4	2.1	1.9	2.6	2.0	1	12	3.3	3.6	3.4	3.3	4
5	3.2	3.2	2.7	2.9	4	13	2.3	2.2	1.4	1.1	4
6	3.1	3.2	2.7	2.7	4	14	2.7	2.2	1.5	1.9	4
7	2.3	2.1	2.5	2.0	1	15	3.6	3.1	3.1	3.1	4
8	3.5	3.5	3.4	3.0	4	16	3.3	3.4	3.0	3.1	4

— REPORT 16 —
CONNECTIONS BETWEEN PERCEIVED COMPETENCE AND UNDERSTANDING ASSESSMENT

Caroline Winchester and Dianne Vorderstrasse

ABSTRACT

One of the highest achievements for teachers is to have their students become lifelong learners. The premise underlying this research is that in order for students to become lifelong learners, they need to change from extrinsic to intrinsic motivation. The more intrinsic the pupil in a given domain, the higher his or her perceived competence in that domain. We also believe that parent involvement enhances student performance.

Twenty-four Algebra II students from St. Paul School and ten chemistry students from Wolbach were involved in the study. At the beginning of the study, students were given a perceived competency test that consisted of two forms, an open-ended fill-in-the-blank test and a structured-alternative format that forced the student to make a choice. A parental survey about assessment was mailed to the parents. A blind study was conducted. Students drew numbers to identify themselves and their parents during the study.

In the chemistry class, stoichiometry involving numerical relationships in chemical reactions was the focus of the unit. Students studied several reactions and had to predict the product. An interview process with the teacher was used to observe students solving problems. In the Algebra II class, both the methods of instruction and assessment were changed. The objectives were to investigate different algebraic relationships, apply them and report findings. The unit involved hands-on activities to collect data, cooperative learning, and the use of graphing calculators. Following the units in both chemistry and Algebra II, students were given the perceived competency test again. A portfolio that contained selections from the student's work was sent home with another parental survey. The portfolio work included reports of experiments, projects, writing assignments, homework and tests. Each student was expected to share the portfolio with the parents and then have the parents complete the survey.

While there was only a slight change in the students' perceived competence, there was a greater change in student performance. In the chemistry class, 80% of the class scored greater than 86% on the unit test. The algebra students were doing more homework and showed more enthusiasm and tolerance for other ability levels. Parental surveys indicated parents were more aware of different ways to assess students and that questioning, as a form of assessment, was held in higher regard. More parents believed self-assessment and portfolios were important and that portfolios should be used in parent-teacher conferences.

EXHIBITS - Report 16

A. Parental Survey for Assessment Awareness - Combined from Two Sites

Check each of the following that you feel apply.

1. My definition of assessment in education is:

pre	post	
5	1	grade
12	16	where student is and where student is heading
1	0	class rank
0	0	GPA
8	3	teacher's idea of what the student knows
10	11	where student is presently and where they should be

2. My definition of evaluation in education is:

pre	post	
6	6	grade
12	13	where student is and where student is heading
3	3	class rank
6	6	teacher's idea of what the student knows
9	13	where student is presently and where they should be

3. Define rubric in education.

pre	post	
0	0	maze
0	2	matrix
3	3	red heading in a book
9	9	established rule or custom
8	13	a set of scoring guidelines

4. How would you rate the importance of student self-assessment?

pre	post	
13	15	is important
9	9	may or may not be used
0	0	should never be used

5. Rank the importance of each of the following methods of assessment.
Use the numbers 1 through 6, with 6 being most important and 1 being the least important.

pre	post		pre	post	
4.68	3.99	homework,	3.71	4.28	how student works with other students
5.72	5.50	test grades/quizzes	3.40	3.67	notebooks
5.18	4.99	labs/activities	4.34	4.34	observation
4.60	5.36	class participation	3.68	4.47	questioning
4.27	4.14	projects			

EXHIBITS - Report 16

B. Parental Survey for Assessment Awareness, Continued

6. What does your student share with you? Rank the occurrence of each of the following. Use the numbers 1 through 6, with 6 being frequently and 1 being seldom.

pre	post	
3.53	3.58	problems they are having
4.45	4.39	successes
3.16	3.45	low grades
4.38	4.19	high grades
3.42	3.55	level of understanding
2.89	3.03	classes
3.63	3.35	test days/projects due
3.88	3.07	when they have homework

7. Have you heard the term "alternative assessment"?

pre	post	
1	2	yes
19	23	no

8. If you answered yes to #7, what is your perception of alternative assessment?
Sample comments: "A different way of determining a student's progress in school." "Something beyond just test scores." "Using other ways than tests to assess kids and their work." "Not relying on traditional methods of grading."

9. Check which of the following you feel are involved in alternative assessment:

pre	post	
9	10	multiple choice tests
13	9	rubrics
7	10	skill tests
8	11	work problems
9	4	notebooks
5	10	portfolios
9	13	observations
10	12	performance tasks
8	4	open-ended questions
10	13	group investigations/problems
16	16	class participation
10	13	self-assessment

10. Did the portfolio help you understand more clearly your son/daughter's progress in chemistry/algebra?
20 yes 1 no

— REPORT 17 —
ALTERNATIVE ASSESSMENT FOR A GEOMETRY BENCHMARK

Jackie Thomas and Donna Trout

ABSTRACT

This project endeavored to create a geometry assessment that more accurately reflects student understanding of the geometric concepts identified in the Omaha Instructional Process outcomes. There appeared to be a discrepancy between the performance on the standard district benchmark test and the understanding of concepts observed by the teacher in the classroom at Bryan High School. We believe that a standard multiple choice test is not the most effective way to evaluate a student's understanding of geometric concepts, so our newly created benchmark incorporates alternative types of assessments.

Phase I of this research attempted to compare results on the existing "Old Benchmark" test to the results on the "New Benchmark" test created for this study. The Old Benchmark consisted of 48 multiple choice questions most of which tested simple recall or gave the student a formula and explanation of unknowns to solve a problem. The New Benchmark consisted of 30 multiple choice questions that required more problem solving skills and six tasks to complete. Five of the multiple choice questions and one task each were correlated to one of the six skill outcomes identified in the Omaha Instructional Process. A page of formulas with no explanation accompanied the New Benchmark. Both tests were administered to four classes of geometry students at the end of the geometry course. A comparison between scores on the multiple choice questions of the two tests showed that students who earned an "A" or "B" in the class tended to score better on the new multiple choice questions where more problem solving skills were necessary. Students who earned a "D" or "F" in the class tended to score better on the old multiple choice questions which tended to be more simple recall and allowed more guessing. Students who earned a "C" in the course showed no significant preference. A shortage of time for the tasks affected the phase I data.

In Phase II of the research, a single task and the five multiple choice questions pertaining to the same outcome were administered to five geometry classes at the end of a unit. These classes were different classes than in Phase I, but taught by the same three teachers. Information was collected on the number of students who passed 1) the multiple choice portion only, 2) the task portion only, or 3) both the multiple choice and the task portions. The results indicated that although some students could pass either format, a significant number of students passed only one portion or the other indicating a need for alternative forms of assessment to measure student learning. In order to complete the study, the remaining five tasks and correlated multiple choice questions will be administered to these classes as the outcomes are covered.

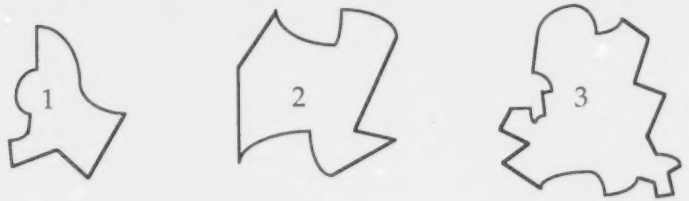
The Omaha Public Schools math supervisor agrees that a benchmark with a varied format is superior to a strictly multiple choice test. We will refine the test after completing the pilot, create a recording method for the district, inservice all district geometry teachers in scoring tasks using suggested rubrics and implement the New Geometry Benchmark for 1995-1996.

EXHIBITS - Report 17

A. New Geometry Benchmark—Task V

A new tile floor is to be laid in the cafeteria. Three geometry students have submitted designs for the new tile; they are shown below. Choose one and answer the following questions.

1) Identify the regular polygon that served as a basis for the tile.
2) What transformation/s will allow the figure to tessellate the plane?
3) Demonstrate the tessellation by tiling the area given on the answer sheet.



I have chosen tile 1, 2, 3 (Circle choice.)
Base polygon? _____
Type of transformation? _____

Tessellations Assessment Criteria

Identification of Characteristics	3	Has correctly identified the type of polygon and transformation involved.
	2	Relevant information was given for both polygon and transformation but not totally accurate
	1	Both answers attempted but relevant information is given for only one
	0	No relevant information given for either the polygon or transformation
Understanding Concepts	3	Has demonstrated correct use of transformations to create a tessellation
	2	Showed evidence of understanding the tessellation, but an error exists or not enough done to be sure of understanding.
	1	An attempt has been made but major errors exist
	0	Lack of understanding of transformations is evident
Skill	3	Has neatly tessellated the entire plane; no gaps or overlaps
	2	Has partially tiled the plane; gaps or overlaps are apparent
	1	An attempt has been made but major errors exist
	0	Blank or no relevant work

EXHIBITS - Report 17

A. New Geometry Benchmark—Task V Continued—Multiple Choice OIPI#9

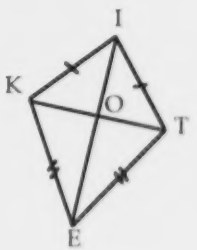
1. The U.S. Pentagon building in Washington, D.C. has how many sides?
   A) 5 B) 6 C) 7 D) 8

2. In parallelogram ABCD, if ∠ A has degree measure 62, what is the degree measure of ∠ B?
   A) 118° B) 28° C) 298° D) 108°

3. How many diagonals can be drawn from point P in the following diagram?
   A) 8
   B) 7
   C) 6
   D) 5

4. What is the sum of the interior angles of an isosceles triangle?
   A) 180° B) 360° C) 270° D) 90°

5. Which of the following is not a property of figure KITE at the right?
   A) KO = TO
   B) IE is a symmetry line for KITE
   C) m ∠KIT = m ∠KET
   D) m ∠KEO = m ∠TEO



— REPORT 18 —
TRADITIONAL VS ALTERNATIVE TEST RESULTS

Mary E. Stiverson

ABSTRACT

The purpose of this study was to determine if the alternative tests that accompany a math textbook correlate with the traditional tests that accompany the same textbook and if the alternative tests give a truer measure of observed student progress.

The Omaha Public Schools adopted a new math text for the elementary schools in 1994 (Addison-Wesley Mathematics, 1991). When the text was used in the classroom, the students showed interest in the curriculum and an understanding of the concepts and algorithms in their daily class work. The California Achievement Test scores indicated student mastery of the subject. Teacher observations of classroom performance also rated students on the mastery level. However, when tested using a traditional student response test, student scores fell short of the expected mastery (80%). Other teachers in the school also voiced concern over this occurring in their classes.

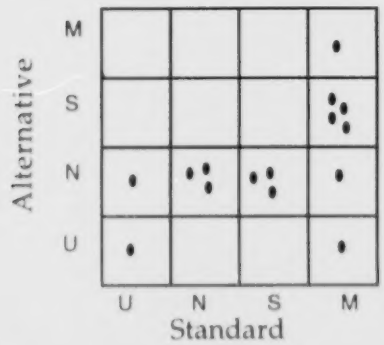
A sixth grade class (n=15) was divided into two groups, and both groups were administered the standard student response test and the alternative test provided by the publisher. To be sure that the order in which the tests were administered did not affect the scores, the order in which each group completed the tests was alternated. The alternative tests were completed as an interview process, with the students having the opportunity to look over the test in advance. A rubric was created to rate student responses as mastery, satisfactory, needs improvement, and unsatisfactory. The scores on the standard tests were then placed in corresponding categories: 80-100 mastery, 70-79 satisfactory, 60-69 needs improvement, 0-59 unsatisfactory. The results were compared.

When comparing student scores, there was a correlation between the standard and alternative test scores as a group. The majority of students scored below the satisfactory level on both tests. Individual student's scores did not show a correlation, however, as students did not consistently score the same on both tests or show a pattern of being more successful on any particular test. It was interesting to see that when students were asked which test they felt more accurately measured their understanding, they chose the alternative tests because the alternative test required them to think rather than just repeat what had been taught.

The results of this study still leave many questions about the tests unanswered: Why are students able to show progress in daily work and still do so poorly on tests? Are too many concepts presented as discrete objects on the test? Are students reading instructions to determine the skill being tested? My next step will be to develop and pilot a test that attempts to test students' ability to compute and to think through math concepts.

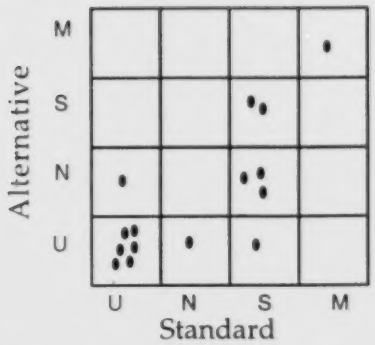
EXHIBITS - Report 18

A. Correlation of Standard and Alternative Tests

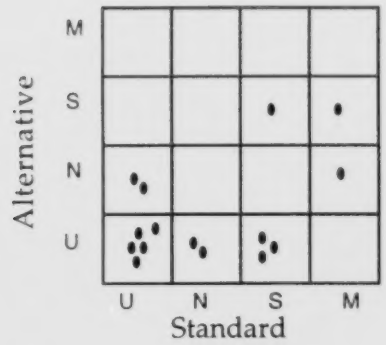


Chapter 1

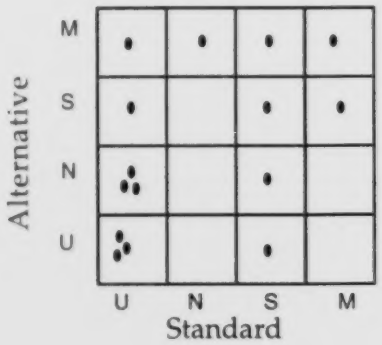
U = unsatisfactory
N = needs improvement
S = satisfactory
M = mastery



Chapter 2



Chapter 3



Chapter 4

EXHIBITS - Report 18

B. Alternative Test Rubric

Mastery	Satisfactory	Needs Improvement	Unsatisfactory
Answers all questions completely, showing or telling more than is required. Is able to give a clear explanation. All answers correct.	Is able to answer correctly or show correct procedure, but is unable to explain clearly.	Some wrong or incomplete answers; unable to explain clearly.	Many wrong answers; explanations unclear or not given.

C. Samples of Student Comments

Which test do you prefer, alternative or standard?

- The test that shows your knowledge in math better is the alternative. I think this because you don't just write it down. You have to explain your answer in front of somebody. Also, you do have to work out the problem. That is why I think the alternative is the better test.
- The standard test tells you more because there are more problems to answer. Then if you are doing something wrong you can see what's wrong easier. So then you can teach it over to the person.
- Alternative because it is done orally and it doesn't have just regular problems. The questions aren't hard unless you didn't pay attention and do your homework.
- The regular test because there are more questions on the test. It takes longer to do and more people understand the regular test than the alternative test.
- I think the standard test was. I think that because the first time we take it you probably don't know what the answers are. As you go on through the chapter, you learn what the problems are and how to solve them.
- Alternative test, because it makes you think a little harder. On the other test it is just like a review on what we already learned. This test (alternative) is more of a challenge, but you should have an idea what is being asked. The alternative test can be accomplished. It just requires a little more thinking. Everyone might get the question right, but explain it in a different way. A sixth grader should be given a harder, more difficult thing to think about, because it will prepare him for the next grade. It will teach him that it will get harder and you have to give a little thought to your answer. To explain your reason for what you think and this will prepare him for debate.
- I think the alternative test is the better indicator because you really have to think and keep trying. On the standard test, you go over the same things you already learned.

— REPORT 19 —
TESTING FOR ALGEBRA READINESS

Vincent Moragues

ABSTRACT

The purpose of this study was to determine the effectiveness of our tests as a selection process for our accelerated mathematics programs beginning in seventh grade. One test is a survey marked by the teacher indicating student mastery of specific math skills. The other test is called our prognosis test.

I addressed the following questions:

1. How do the two test scores correlate with mathematics grades?
2. How did the two test scores correlate with sixth grade S.A.T. scores?
3. What are the percentages of males and females electing to take the tests and scoring high enough to be selected for the accelerated mathematics program?
4. How do student scores differ by the elementary school that they attended?
5. Can steps be taken to make the testing process more fair?
6. What procedures do neighboring school districts use to identify students for acceleration in mathematics?

To answer these questions, the needed data were compiled in spreadsheets. The data were graphed in a variety of ways to compare the variables. A survey of surrounding school districts was conducted to explore their procedures for selecting students for accelerated mathematics programs.

After examining the data, it appears that the two pencil and paper tests our district uses do correlate with mathematics grades. The two tests also appear to correlate with S.A.T. scores. Some gender equity questions have arisen and are seen more clearly now. The percent of tested males and females being placed in the accelerated classes are not equivalent. Some differences in scoring by students from different elementary buildings were observed and headway seems to have been made to make the results more uniform across the school district. Further research needs to be done to find a variety of placement options.

EXHIBITS - Report 19

A. Percent of Students Tested and Selected

Class of 1999 (this year's 8th graders)

	Females	Males	Total
Tested	81/171 (47.4%)	86/178 (48.3%)	167/349 (47.9%)
Pre-Algebra Placement	29/81 (35.8%)	40/86 (46.4%)	69/167 (41.3%)
Changes	4 added, 1 out	5 added, 1 out	

Class of 2000 (this year's 7th graders)

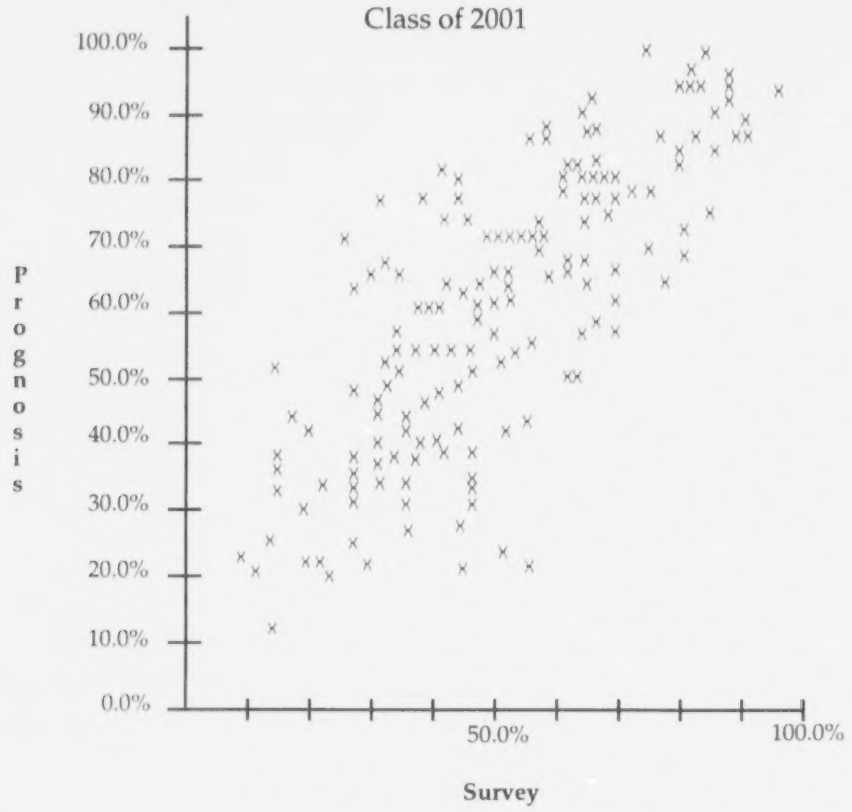
	Females	Males	Total
Tested	79/183 (43.2%)	98/204(48.0%)	177/387 (45.7%)
Pre-Algebra Placement	19/79 (24.1%)	38/98 (38.8%)	57/177 (32.2%)
Changes	1 out	5 added	

Class of 2001(next year's 7th graders)

	Females	Males	Total
Tested	91/163 (55.8%)	89/180 (49.4%)	180/343 (52.5%)
Pre-Algebra Placement	21/91 (23.1%)	35/89 (39.3%)	56/180 (31.1%)
Changes	unknown	unknown	

EXHIBITS - Report 19

B. Correlation Between Two Placement Tests: Prognosis Test Scores and Survey Test Scores
Scatter Plot: Each "x" Represents an Individual's Two Scores



— REPORT 20 —
NECESSARY COMPONENTS OF A RUBRIC

Audrey Bacon

ABSTRACT

This research examined the components needed in a rubric for alternative assessments. The goal was to use rubrics to enhance student perceptions of teacher expectations. Different components and types of rubrics were used with alternative assessments that included project evaluations, interviews, videos, and self-assessments. Rubrics were also used in cooperative learning, behavior modification and end-of-year surveys.

Seventy-seven students in classes ranging from seventh grade mathematics, pre-algebra, freshman algebra, geometry, and advanced algebra, to precalculus were involved in the creation of some of these rubrics and assessment by them.

The results showed that student personal preference played a major role in developing rubrics, but usable scoring methods, relevant criteria, appropriate wording, and student input were necessary components for effective rubrics. One of my first rubrics assessed a toothpick bridge-building activity. I used a teacher observation checklist to note occurrence of different work habit behaviors (i.e., "works neatly, gets work in on time") to measure flexibility, and to measure perseverance. Although this checklist told me little, it did give me more insight into a few students. Another activity involved exchanging videotapes with a neighboring school. The tapes had student-created math problems designed to stump students at the other school. I used a ten point rubric but found that ten points created too many decisions for me. I evaluated the organization of the student group, the originality of the problem, the video script, the presentation, and the student cooperation/listening. When the geometry students constructed solids, the rubric was based on accuracy of volume measurement for comparing the various solids. After students worked on a group quiz, I interviewed them on how to solve a particular problem. In my precalculus class, the students were given one collective grade for working together to solve a set of problems. I then interviewed each one individually for a second grade. The scoring rubric for the group activity focused on the completeness and clarity of the report, exploration of pertinent aspects of the problem, supporting arguments, demonstrated understanding of the mathematical ideas and processes, going beyond requirements of the problem, and group participation.

One of the challenges of using rubrics for assessment and evaluation this year has been translating what I've done into a number equivalent to fit into our school's grading system. Despite this challenge, I plan to continue my research on rubrics. I would like to expand what I've done this past year by developing a rubric-based evaluation system. All work would be evaluated by rubrics so that students and parents would have more information than just a number grade.

EXHIBITS - Report 20

A. Student-Created Rubric for Student-Created Games (presentation of games also rated)

Age Levels
- 4 Very appropriate
- 3 Somewhat appropriate
- 2 Slightly appropriate
- 1 Not appropriate

Educational Value
- 4 Very educational
- 3 Somewhat educational
- 2 Slightly educational
- 1 Not educational

Entertainment Value
- 4 Exciting
- 3 Fun
- 2 Tolerable
- 1 Boring

Clarity of Rules
- 4 Very understandable
- 3 Understandable
- 2 Incomplete
- 1 Confusing

Creativity
- 4 Totally original
- 3 Kind of original
- 2 Borrowed ideas from another game
- 1 Exact copy of another game

Quality
- 4 Looks great and is durable
- 3 Some imperfections
- 2 More imperfections
- 1 Flimsy

EXHIBITS - Report 20

B. Student-Created Adjectives for Rubrics

4	3	2	1
• excellent	• good	• passable	• mediocre
• awesome	• peachy	• respectable	• average*
• great	• clever	• satisfactory	• tolerable
• first-rate		• adequate	• ordinary
• extraordinary		• acceptable	• unremarkable
• outstanding		• fair	• mundane
• superb		• sufficient	• unexcep-tionable
• wonderful			
• super			
• terrific			
• superior			
• optimum			
• best			
• tops			
• top-notch			
• splendid			
• best			

* Note the use of "average" by the students to describe poorer work.

— REPORT 21 —
DO THEY REALLY UNDERSTAND FRACTIONS?

John Moon

ABSTRACT

Traditionally, I have tested my students' skills in fractional numbers by giving them a set of problems that I then methodically check, answer by answer. I have wondered whether this was giving me a true picture of student progress or skill level. I never felt satisfied with the results nor with student retention of the skills.

I decided to try alternative assessment with two fraction skills: comparing fractions and changing between mixed numbers and fractions. I used lessons suggested in "Seeing Fractions," developed by TERC, as a starting point. The concept of a fraction was developed using dot paper and drawing examples of halves, fourths, thirds, etc. An important concept I wanted to test for both skills was finding equivalent fractions. This concept was developed by having the students draw additional lines on dot paper to change a fraction to an equivalent fraction. Erasing lines on their drawings proved to be an effective way to change fractions to lowest terms.

To assess whether students understood how to compare fractions, I gave the students a problem that involved deciding which of two baseball players should be selected to be the batter. Students based their decision on the number of hits per times at bat for each of the players. The students were asked to explain why their choice was the best. The students then drew pictures, showed equivalent fractions, and wrote about their reasoning. As I checked their work, I was able to understand better their skill level.

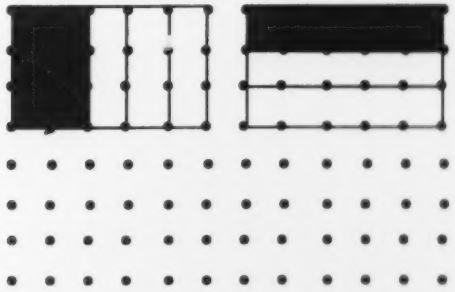
A problem about pizza provided the context for students to show what they knew about changing between mixed numbers and fractions while subtracting. The students had to decide how much pizza was left over and how many slices were left. They had to show how they arrived at their answers. They drew pictures to represent the pizzas, shaded the fraction eaten and even counted the part left over. Their explanations provided insight into their thinking and the misconceptions that they had developed.

This project gave me valuable information about the skill level of the students and the need to evaluate students with more than a set of problems and correct answers. Our school district is in the process of developing a set of essential skills for students and various forms of assessment to validate skill attainment. I think this project has helped me to see the impact that assessment should have on instruction and vice versa.

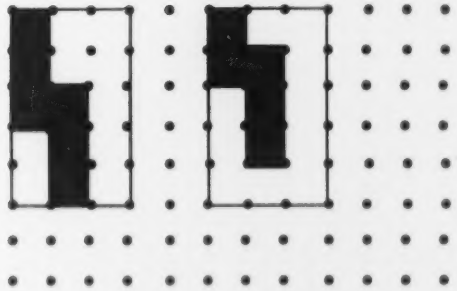
EXHIBITS - Report 21

A. Students Picturing Fractions

Baseball coaches evaluate their players to decide who plays. Coach Bob needs to select the best player. John has hit two out of five times at bat or 2/5 of the time, while Andrew has hit one out of three times at bat or 1/3 of the time. If you were Coach Bob, which one would you play? Explain your choice.



I would play John because he could have hit six out of 15 while Andy hit 5 out of 15.

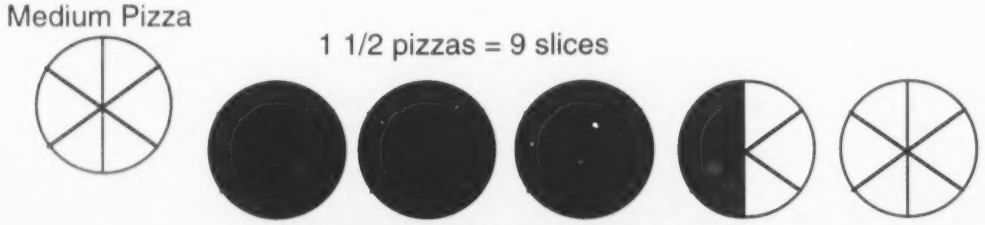


I would choose John, because if you make a fraction showing 2/5 it is worth more than 1/3. I know this because if two equal squares consisting each of 15 small squares (15 is a multiple of 5 and 3 from 2/5 and 1/3), 2/5 of 15 is 6 and 1/3 of 15 is 5 and 6 is greater than 5.

EXHIBITS - Report 21

A. Students Picturing Fractions Continued

Today our class is ordering pizza. We ordered 5 medium pizzas, but ate only 3 1/2 pizzas. How many pizzas did we have left? How many slices? Explain your answer with drawings and numbers.



If they had five pizzas and ate 3 1/2, they would have one full pizza (3 1/2 + 1 = 4 1/2) and then they would also have one half (4 1/2 + 1/2 = 5).

Next week your best friend has a pizza party. They order 7 large pizzas and eat 4 3/8 pizzas. How many pizzas did they have left? How many slices? Explain your answer.

If they ate 4 3/8, they would have 2 full pizzas left (4 3/8 + 2 = 6 3/8) and they would also have 5/8 left (6 3/8 + 5/8 = 7).

— REPORT 22 —
THE SCHOOL IMPROVEMENT PROCESS

Gail Sears

ABSTRACT

School improvement is a process that takes collaboration of students, teachers, administration, and the community. It is a research based procedure synthesizing findings about effective teaching and instruction, educational leadership, curriculum and assessment. In our school district, the process began with a steering committee consisting of two principals, a counselor, a community member, several teachers and a special education coordinator. The first year was spent gathering data to discover areas needing improvement. This data included school climate surveys, student profiles, test scores and a community satisfaction survey. The steering committee then selected five areas for improvement: instruction, critical thinking skills, student behavior, student self-esteem, and assessment.

I became the chair of the instruction committee which labored through a packet of data prepared by the steering committee before selecting the target goal. The group had personal concerns including the improvement of technology in the classroom, but were reminded by the steering committee to address the weakest areas reflected by the test scores. Our committee's goal became the improvement of written communication across the curriculum, and our first job was to collect data to see if writing actually did need improving. Our school district had writing samples gathered by the special education coordinator who was analyzing the results for a class assignment. How could we assess how well our school was doing with written communication? We did not have an assessment tool. We decided to interview staff, parents and high school graduates. The survey did show that parents thought more written and oral reports and more creative writing were needed. Parents and teachers both agreed mechanics needed to be a focus. The concerns of the recent high school graduates also indicated a need for more oral and written grammar skills.

We developed a plan. We used a staff survey to assess what each teacher was doing to teach writing. The surveys showed little continuity and few systematic approaches to writing instruction, but there were various techniques being used. The second step was to provide outside writing opportunities and resources to the students with a professional writer at a county art council function. He shared his poetry, explained the process of writing poetry, and had the students write poems. Next, committee members attended a rubric workshop at the Educational Service Unit. They brought back a battery of rubrics for assessing student writing. Our latest activity was collecting writing samples for the baseline data in grades 5, 8, and 11.

I have discovered several keys to the school improvement process. First, define the needed terms so that everyone involved has a common understanding. Second, plan meetings after school to meet the community members' agenda. Most important, start with a smaller goal than improving writing. Use your work on the first goal to learn a procedure for successfully working together to accomplish a goal.

EXHIBITS - Report 22

A. Timeline

ACTION	STATUS
• Develop Student Profile	Work in Progress
• Write Mission Statement	Draft Completed
• Select Target Areas	Pending Board Approval
• Write Target Area Goals	Work In Progress
• Building Plan Developed by Building Level Team and Community Members	After Target Area Goals Approved
• Gather Baseline Data	February-May 1994
• Analyze Data	February-May 1994
• Set Expected Performance (how you will know success)	February-May 1994
• North Central Team Visit	May 1994
• Determine Improvement Strategies	Summer-Fall 1994
• Write Improvement Plan	Summer-Fall 1994
• Implement Plan	1994-1995
• Complete or Revise Plan	1994-1995

B. Teacher Survey

1. List examples of writing techniques used in your classroom.
2. What systematic process do you use in teaching writing?
3. How do you assess the written work? Do you grade on content, mechanics, style, etc.?
4. In a normal week, how often do your students write?

EXHIBITS - Report 22

C. Holistic Writing Assessment Rubric for Narrative Writing-Grade Two
source: Educational Service Unit 7

Score	4	3	2	1
Content	Character development enhances the story. Has an identifiable setting. Shows an awareness of plot. Unique story that shows creativity and fluency.	Story responds creatively to the prompt. Demonstrates an awareness of setting. Has a discernible character.	Story responds to the prompt. Demonstrates an awareness of character development.	Does not respond to the prompt.
Organization	Has beginning statement that tells the main idea or topic. Has details to support the main idea. Has several sequential sentences that expand the idea. Has an appropriate ending. Has a title.	Has a beginning that tells the main idea or topic. Has details to support the main idea. Most sentences are appropriately sequenced. Has an abrupt ending.	Has a recognizable beginning that states the main idea or topic. Demonstrates a beginning awareness of sequence. Some ideas/details may be irrelevant.	Uses lists of ideas not linked together or sequenced.
Style	Uses a variety of sentence lengths, structures and types. Uses dialogue to create interest. Uses descriptive language to enhance imagery. Expresses ideas in an original manner.	Uses variety of sentence lengths, structures and types. Begins to use dialogue. Begins to use some descriptive words.	Begins to use a variety of sentence lengths and types. Some sentences may be rambling.	Uses short, simple sentences.
Mechanics	Consistently uses capital letters to begin sentences, for proper nouns, and in titles. Uses sentences ending with periods, exclamation marks, and question marks. Uses commas, quotation marks and apostrophes appropriately most of time. Usually spells words correctly.	Consistently uses capital letters to begin sentences and proper nouns. Consistently uses capitals with names of people. Uses complete sentences with periods at the end. Uses commas, quotation marks, and apostrophes. Usually spells words correctly but misspelled words are phonetically correct. Demonstrates neat, legible handwriting.	Consistently uses capital letters to begin sentences. Uses capital I and begins to use capital letters with proper nouns. Uses few sentence fragments and/or run-on sentences. Uses phonetic spellings which omit some sounds. Demonstrates legible handwriting.	Some use of capital letters to begin sentences. Uses capital I. Uses many sentence fragments and run-on sentences. Spelling errors make reading difficult. Legibility makes reading difficult.

— REPORT 23 —
THE MARIGOLD PROJECT: A REFLECTIVE CONVERSATION

Kathryn A. Ahern and Suzanne Oldham

ABSTRACT

The purpose of this qualitative study was to observe a sixth grade teacher as she amended her current language arts portfolio project to include a science research project. Suzanne, the sixth grade teacher asked, "Can science be integrated into the language arts portfolio?" as she examined the students' learning while conducting long term experiments with marigold seeds. Kathryn, the university researcher, examined Suzanne's interpretation and procedures while integrating more science activities into her curriculum. Kathryn and Suzanne engaged in reflective conversations on the emerging understanding of the process.

Science was integrated into the existing writing process through science research journaling, research/writing projects, and reading materials. Existing evaluation checklists were redesigned and developed into new rubrics. Although parallels were seen between science problem-solving skills and reading objectives, a significant difference was noted in the reading/writing editing process. Editing, both peer and teacher, is critical in the language arts process. However, this evaluation category for the science research journal became self-evaluation/rethinking. A scientist would not edit the work in her science journal in the same way as a literary journal. Students demonstrated they understood the similarity between the literature log journaling process and the science research journaling when explaining the process to a visiting teacher-researcher, Julia Polak. The students explained clearly and in great detail how the reading/writing workshop classroom works and how the marigold project and our science themes were integrated into the literature we read. The students had a part in the design and that gave them ownership. This understanding facilitated the transition from the teacher-as-leader to the teacher-as-facilitator.

Kathryn examined the process of one professional assisting another to implement new practices. The first noted theme was the importance of collaboration based on mutual benefit and trust. The researcher was accustomed to educational research and had access to and experience with scientific materials and instruments. The sixth grade teacher had students and classroom experience in literature-based portfolio assessment. The reflective conversations between the two—called "bugging, in a good sort of way"—surfaced the rationale for and definitions of science, reading, and writing integration. A clearer vision of the connections resulted in new rubrics. The uncertainty in science research was obvious. Using a whole-language approach to science involves a new way of thinking that may be messy and unclear and involve trial and error. The third theme was that collaboration is time consuming and moves in uneven, energetic bursts. However, the collaborative partnership was by far the most important way in which progress was made. The teacher now has more experience with science and research and has access to additional resources. The researcher has benefited from the qualitative research experience and an insider's view of a sixth grade classroom. A new way of thinking about science education using whole-language strategies was gained by both.

EXHIBITS - Report 23

A. Rubric Samples

Criteria	4 Commendable	3 Satisfactory	2 Some Achievement	1 Learning in Progress
Reading Completed literature log ready for conference	On time All items	On time One item not included	On time Two items not included	On time More than two items not included
Science Completed research journal; evaluation ready	On time All items	On time One item not included	On time Two items not included	On time More than two items not included
Reading Makes predictions prior to reading the assigned pages	Verifiable prediction Appropriate to story Makes sense Shows insightfulness	Verifiable Follows the reading	Prediction shows misunderstanding or does not make sense Not verifiable	Not verifiable Does not fit the story
Science Makes predictions about future observations and necessary thinking	Verifiable prediction Relates to observation Makes sense	Verifiable Follows the observations	Prediction shows misunderstanding or does not make sense Not verifiable	Not Verifiable Does not fit the observation
Reading Summarizes the reading	Detailed support without rewriting Has all main events	Most main events or ideas Support and detail	Errors in the character information	Little or no attempt Erroneous information
Science Makes regular observations	Identified similarities and differences Exceptional details	Identified major similarities and differences	Errors in major similarities and differences	Significant errors
Reading Responds/reacts to the reading	Response shows understanding and expresses opinion or idea on the reading	Response and/or reaction with understanding	Confused responses and/or reactions	Draws wrong conclusions or gives little information
Science Makes comparisons	Detailed; inferences or conclusions; compared selected characteristics	Assessed major similarities and differences	Errors in making comparisons	Significant errors

EXHIBITS - Report 23

A. Rubric Samples Continued

Criteria	4 Commendable	3 Satisfactory	2 Some Achievement	1 Learning in Progress
Reading Overall appearance	Picture perfect, dated, signed, stamped for conference, evaluation prepared, neatly written	One item or entry missing	Two items or entries missing	More than two items or entries missing
Science Overall appearance	Entries are dated, signed, stamped for evaluation, legibly written, clear, organized	One item or entry not complete	Two items or entries not complete	More than two items not complete
Reading Editing is evident	Peer has edited and signed, teacher makes 0-2 editing corrections	Peer has edited and signed; teacher makes 3-5 editing corrections	Teacher makes 6-9 editing corrections	Too many errors
Science Self-evaluation/rethinking	Identifies any errors, makes comments why there are errors and makes corrections	Identifies possible errors and comments	Fails to recognize important errors or make corrections	Recognizes insignificant errors

B. Example of Student Science Writings

September 12: *I think this is going to be fun. I hope we can communicate with other classrooms that are doing this. I think groups 1, 2, 3, and 4's marigolds will sprout.*

September 15: *My group 2 has the strongest, tallest, and healthiest sprouts. Everybody else has at least 1. Control had 5 sprouts. They looked healthy. Group 1 had 4 sprouts. They looked fairly healthy. Group 3 had 3 sprouts. They looked liked Group 1. Group 4 had 4 sprouts. They looked like 1 and 3. Group 5 had 1 sprout. It was tiny. I think Groups 1, 2, 3, and 4's seedlings are going to be fairly small, but just tall enough to see them.*

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Mathematical Sciences Education Board (1993). *Measuring What Counts.* Washington, DC: National Academy Press.

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— APPENDIX A —
ACTION RESEARCH RUBRICS

I. **Portfolio** (40 % of credit; four criteria, each with four levels of performance)

Purpose: To provide structure to the investigation and to serve as a display or "scrapbook" for others and for oneself.

Table of Contents

Rationale for selection of items in portfolio

Evidence of investigation focused on assessment--
- Question of investigation
- Description of data collection techniques
- Conclusions

Evidence to support conclusion(s)
- Description and/or summary of data
- Description of data analysis process

Evidence of reflection on the action research process and results
- Choices may include journal entries, a diary, audio and/or video tapes, recorded conversations with other participants or other educators, flow charts, photos, other

Evidence of collaboration
- Choices may include written comments reflecting upon a colleague's investigation, photos, diary of conversations with others, tapes, other

Evidence of review of outside resources focused on assessment topic
- Choices may include abstracts, journal articles, interviews, other

Plan of action after the investigation is completed

Self-designed self assessment of your portfolio

A. **Required items are included in the portfolio.**
- 4 All items are included in the portfolio.
- 3 One item is not included in the portfolio.
- 2 Two items are not included in the portfolio.
- 1 More than two items are not included in the portfolio.

B. **Makes and articulates accurate conclusions from the gathered data.**
- 4 Draws conclusions that reflect clear and logical links between the gathered information and the interpretations made from them.
- 3 Presents conclusions that, with few exceptions, follow logically from the gathered information.
- 2 Presents some conclusions that reflect erroneous interpretations made from the gathered information.
- 1 Draws many erroneous conclusions from the selected information and cannot satisfactorily describe the rationale behind the conclusions.

— APPENDIX A —
ACTION RESEARCH RUBRICS

I. **Portfolio** (40 %) **Continued**

C. **Demonstrates an understanding of the action research process.**

4 Evidence is provided that the action research process was conducted, leading to a conclusion(s) thoroughly supported by the gathered information.
3 Evidence is provided that the action research process was conducted, leading to a conclusion(s) adequately supported by the gathered information.
2 Adequate evidence is not provided that the action research process was conducted, leading to a conclusion(s) adequately supported by the gathered information.
1 Several omissions are made in the action research process.

D. **Effectively uses a variety of methods to display items in the portfolio.**

4 Uses several effective methods to present different portfolio items.
3 Uses at least two effective methods to present different portfolio items.
2 Uses only one effective method to present items.
1 Portfolio items are not presented in an effective, communicative manner.

II. **Performance Task - Presentation** (20% of credit; two criteria, each with four levels of performance)

Purpose: To share research findings with colleagues and bring summary and closure to the initial investigations.
What: 1 hour presentation on research and findings
To Whom: Class participants and invited guests

A. **Uses variety of methods to present information in an attempt to interest the audience.**

4 Uses a variety of methods to present information.
3 Uses more than one method to present information.
2 Uses only one method to present information; it appears to gain attention.
1 Uses only one method to present information; it fails to gain audience attention.

B. **Clearly presents the major components of the research.**

4 The research question(s), data collection methods, data analysis process, results, and future plan(s) of action are clearly given in the presentation.
3 The research question(s), data collection methods, data analysis process, results, and future plan of action are recognized in the presentation.
2 The research question(s), data collection methods, data analysis process, results, and future plan of action are obscured in the presentation.
1 The research question(s), data collection methods, data analysis process, results, and future plan of action are not each contained in the presentation.

— APPENDIX A —
ACTION RESEARCH RUBRICS

III. Participation in seminars (40 % of credit; four criteria, each with four levels of performance)

Purpose: To provide a supportive environment in which all participants assume responsibility for that environment and the professional growth of themselves and the other participants.

When: August 27, November 12, February 11, and March 18

Assessed by : De Tonack and UN-L staff facilitators

A. Participates in seminars.

4 Actively involved in all sessions of the seminars.
3 Actively involved in most sessions of the seminars.
2 Moderately involved in most sessions of the seminars.
1 Moderately involved in some sessions of the seminars.

B. Reflective (i.e., evaluates the effectiveness of own actions).

4 Reviews actions thoroughly and from as many points of view as is useful.
3 Reviews actions reasonably well and from several points of view.
2 Reviews actions infrequently and from only one point of view.
1 Makes no effort to review actions.

C. Contributes to seminar group maintenance.

4 Actively helps the group identify changes or modifications necessary in the group process and works toward carrying out those changes.
3 Helps identify changes or modifications necessary in the group process and works toward carrying out those changes.
2 When prompted, helps identify changes or modifications necessary in the group process, or is only minimally involved in carrying out those changes.
1 Does not attempt to identify changes or modifications necessary in the group process, even when prompted, or refuses to work toward carrying out those changes.

D. Works toward the achievement of seminar group goals.

4 Actively helps identify group goals and effectively carries them out.
3 Communicates commitment to group goals and strives to carry them out.
2 Communicates a commitment to the group goals but does not strive to carry them out.
1 Does not work toward group goals or actively works against them.

— APPENDIX B —
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